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COVER: Killer whales (foreground) pursuing sea lions (bow of ship). See account by Jim Branson on p. 39.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the National Marine Fisheries Service (formerly Bureau of Commercial Fisheries).

FISHERMEN'S MEMORIAL--GLOUCISTER, MASS.

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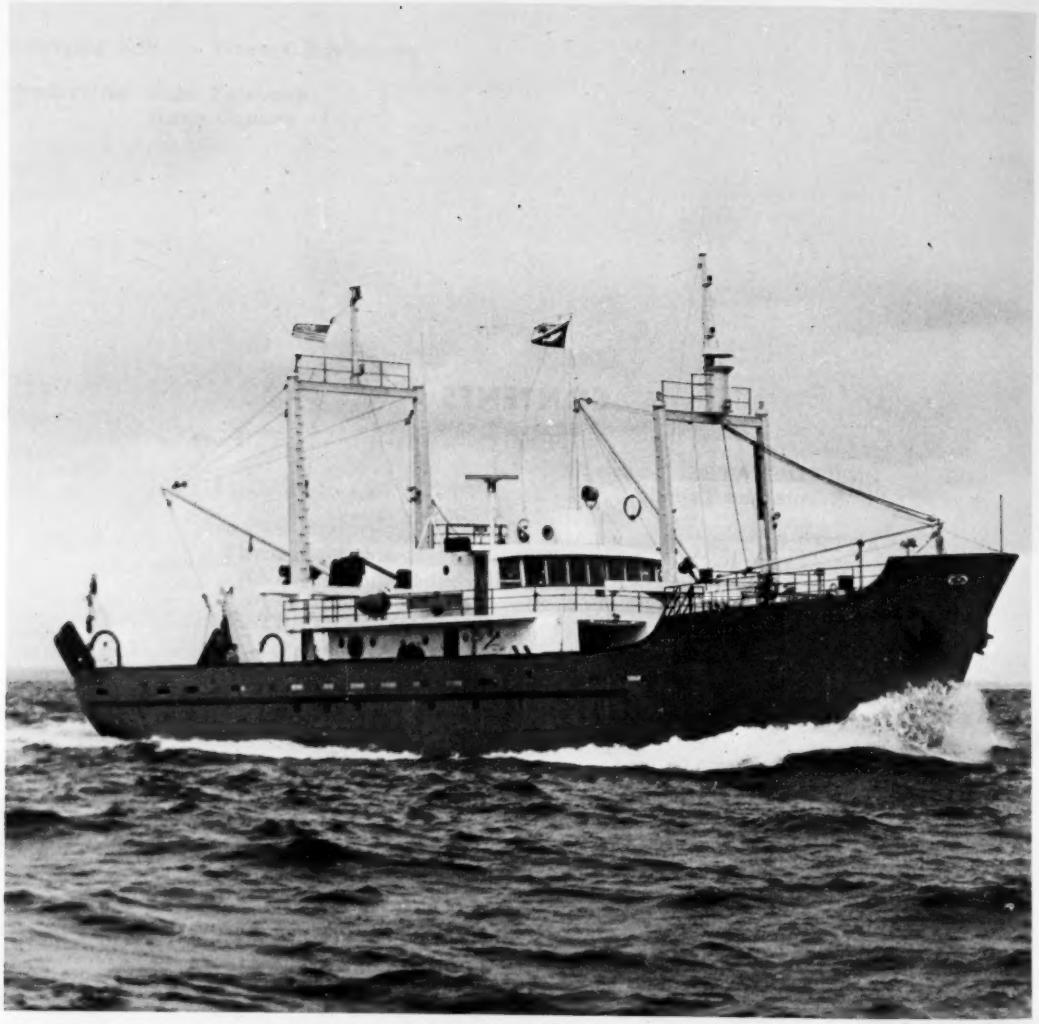


The NMFS research vessel 'Delaware II' sails from Woods Hole, Mass., to assess shellfish resources south of New England. See cruise report page 9.

INTERIOR & COMMERCE TO CELEBRATE 100 YEARS OF FISHERY CONSERVATION

Secretary of the Interior Rogers C.B. Morton has announced that his department and the Department of Commerce will sponsor a conference on "Fish in Our Lives" in Washington, D.C., in December 1971 to commemorate the 100th anniversary of Federal fishery conservation efforts.

The conference is expected to attract fishery scientists, economists, sport-fishing interests, and nutritionists. The conference will deal with many aspects of fishery resources, including the growing menace of pollution.

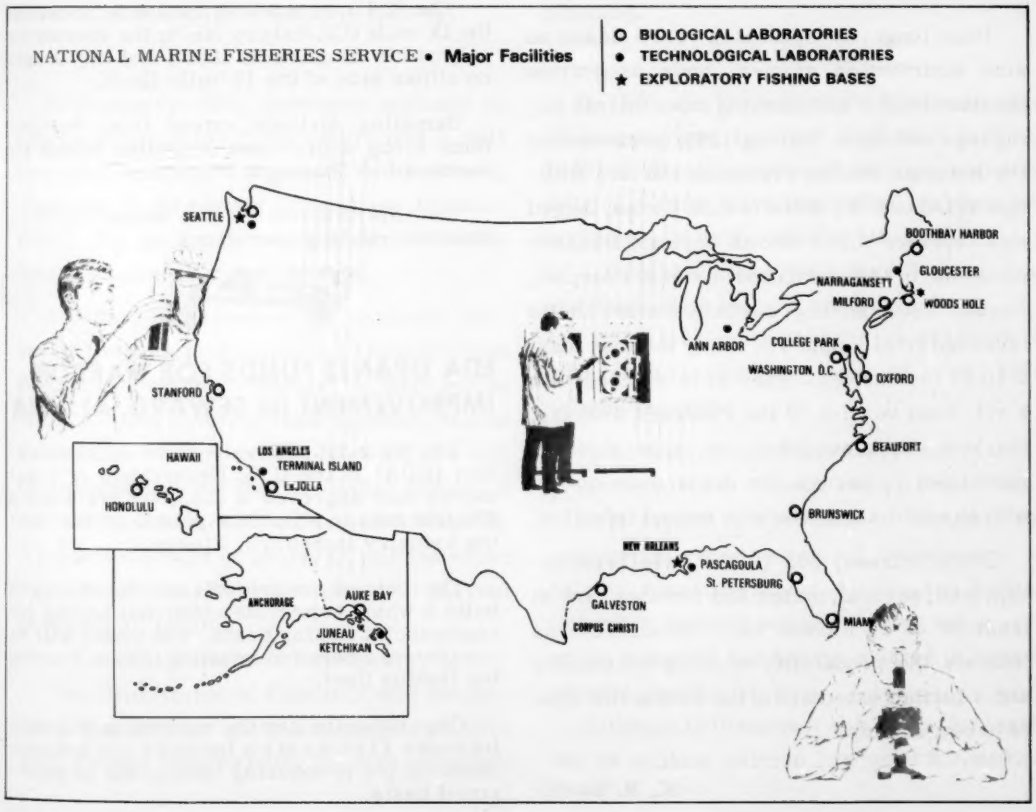
Secretary Morton said Federal fish hatcheries and laboratories will hold open house during the year.

Began in 1871

In 1871, Spencer Fullerton Baird was appointed first commissioner of fish and fisheries. President Grant signed an act "for the protection and preservation of the food fishes of the coasts of the United States." Since then, Federal fish conservation has been the responsibility of a succession of agencies--at present, Interior's Bureau of Sport Fisheries and Wildlife (BSFW) and Commerce's National Marine Fisheries Service (NMFS).

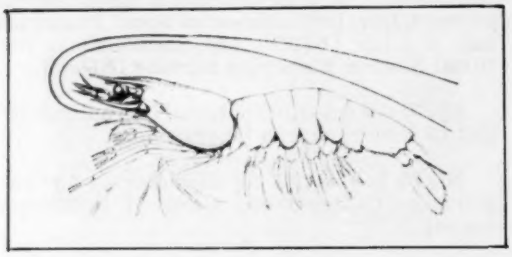
BSFW operates 100 national fish hatcheries and 16 fish-research laboratories.

NMFS has nearly 30 laboratories and exploratory fishing bases involved in fishery research.



BROWN SHRIMP LIVE LONGER THAN MANY BIOLOGISTS BELIEVE

It has been generally accepted among fishery biologists that the average life span of the more important penaeid shrimps is about 1 to 1½ years. However, recent evidence suggests that they live considerably longer.



Past longevity estimates were based on size distribution studies, body proportion measurements, and marking experiments using tags and dyes. During 1969, personnel of the National Marine Fisheries Service Biological Laboratory at Galveston, Texas, tagged and released 6,514 brown shrimp, Penaeus azetecus, in 24 fathoms southwest of Freeport, Texas. These shrimp, sexually mature adults (average total length 169 mm), were at least 8 to 12 months old. They were marked with a cut-down version of the Petersen disc tag, the best mark available for large shrimp. Pins used to secure the discs were coated with an antibiotic mixture to retard infection.

Since release, 583 (8.9%) have been recaptured; several, males and females, are at least 20 to 27 months old. Recent returns indicate the probability of more recoveries and a further extension of the known life span of brown shrimp.

--K. N. Baxter

U.S. AND USSR STUDY SHRIMP IN GULF OF ALASKA

The abundance and distribution of northern shrimp over a large part of the Gulf of Alaska is being studied in a cooperative U.S.-USSR research project.

The project resulted from discussions between U.S. and Soviet scientists in Moscow, December 1970. Such meetings are provided for in U.S.-USSR agreements concerning North Pacific fisheries as opportunities to study the status of resources.

The Vessels & Areas

Three research vessels are participating: the Soviet 'Krill', the NMFS 'Oregon', and the 'Resolution' of the Alaska Department of Fish and Game.

The Krill is working exclusively outside the 12-mile U.S. fishery limit; the Resolution only within the 12-mile limit; and the Oregon on either side of the 12-mile limit.

Sampling stations extend from Portlock Bank along south coast of Kodiak Island and westward to Shumagin Islands.

Two NMFS scientists are aboard Krill to observe trawling operations.

EDA GRANTS FUNDS FOR HARBOR IMPROVEMENT IN SEWARD, ALASKA

The Economic Development Administration (EDA) of the U. S. Department of Commerce has approved a $288,000 grant and a $72,000 loan to stimulate growth of the fishing industry in Seward, Alaska.

The City of Seward will use the money to build a wharf to provide additional berths for commercial fishing boats. The wharf will be constructed between existing docks serving the fishing fleet.

City officials say the expansion will help increase fishermen incomes and enhance plans to put processing operations on year-round basis.

ALASKA'S SALMON FORECAST

Alaskan salmon harvests of slightly over 40 million fish of all species are projected for 1971 season, reports Melvin C. Seibel, Alaska's Commercial Fisheries Division. If this harvest is achieved, it would produce about 2.3 million cases of canned salmon--and 15-20 million pounds of fresh, frozen, and cured salmon products.

In 1970, about 66 million salmon were harvested. The lower projected harvest for 1971 reflects weakness in recent odd-year pink salmon runs to Southeastern Alaska and Kodiak, and an off-cycle year for Kvichak River system. The latter is the major contributor to Bristol Bay sockeye fishery.

1971 Forecasts

Preliminary 1971 forecasts indicate an especially weak predicted return of 4.3 million pink salmon to Southern Southeastern. This size could sustain little, if any, harvest; nearly the total return would be needed to meet escapement requirements.

Northern Southeastern has projected harvest of 5 million pink salmon. Prince William Sound has a brighter outlook: a total return of 6.2 million pinks, and harvest projection of 4.7 million. Seven million pink salmon will be available for harvest in Kodiak fishery if forecasted return of 8.3 million materializes. A predicted return of nearly 17 million sockeye to Bristol Bay fishery would yield harvest of nearly 10 million.

What Estimates Depend On

The Department of Fish and Game emphasizes that harvest estimates depend on 1971 total salmon returns being the size expected. Weaker returns may require more restriction of harvests to insure desired escapement goals. Larger-than-forecast returns may allow relaxation of regulations to insure maximum allowable harvest.

The forecasts result from extensive studies each year throughout state. Estimates of parent spawning populations and later abundances of young salmon gotten during past several years were analyzed for 1971 forecasts. In areas such as Prince William Sound, these techniques have been refined repeatedly. They now provide forecasts with sufficient accuracy for management and operational planning.

1970 Forecast

In 1970, the Department's first statewide salmon-harvest forecast (released in Nov. 1969) of 96 million proved too high; about 66 million salmon were harvested. Salmon returns considerably smaller than anticipated in 3 major Alaskan fisheries--Southcentral and Kodiak pink salmon, and Bristol Bay sockeye fisheries--accounted for roughly 90% of difference between projected and actual 1970 salmon harvest.

Total returns below forecast levels in these areas required additional restriction of harvest to insure achievement of adequate escapements. Widespread weaknesses in salmon runs throughout Alaska and British Columbia suggest possibility that below-average survival conditions existed in ocean-rearing areas.

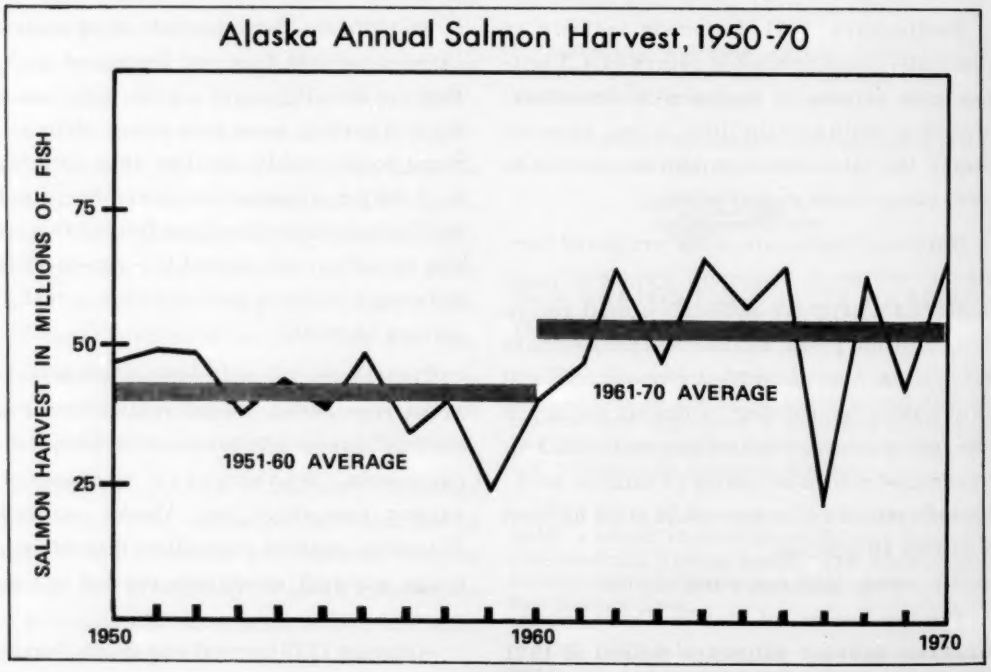
Although 1970 harvest was below forecast, the 66 million salmon produced 3.7 million

cases, and the largest harvest in more than 20 years. Major contributions included 10 million pink salmon from Southeastern, 12 million pinks from Kodiak, and 21 million sockeye from Bristol Bay.

State Optimistic

The Department is optimistic about the future of Alaska's salmon resources. This is not based on the size of a salmon harvest for any single year. Because salmon populations exhibit large natural fluctuations, it is necessary to base measures of population health on averages or trends. The graph below depicts annual commercial harvests of salmon in Alaska for 1951-70.

The two horizontal bars represent average annual harvest levels for the two 10-year periods--1951-60 and 1961-70. Average annual salmon harvests during the latter have exceeded by about 12 million fish the average of previous 10-year period. On a cumulative basis, this increase resulted in 120 million more salmon for Alaskan fisheries since 1961. If there are no natural catastrophes, or loss of salmon habitat from unwise development of other resources, Department biologists are confident that this higher level of production can be sustained and also increased. The Department emphasizes that achievement of maximum sustained harvest is primary goal of commercial fisheries management.



A Special Report on

FISH BLOCKS and STICKS and PORTIONS

Morris R. Bosin, Clemens B. Bribitzer,
Donald R. Whitaker
NMFS Division Current Economic Analysis

In 1970, supplies of blocks, sticks, and portions increased, but the rate of increase was not so great as in 1969. Imports of blocks were high in first-half 1970 but dropped sharply in second half as inventories were depleted in exporting countries.

The shortage of blocks, especially cod, caused prices for all blocks to rise; these reached record levels in December. As prices rose, U.S. inventories fell to 30.7 million pounds at the end of 1970.

Production of sticks and portions in 1970 increased 6% over 1969 but, in the fourth quarter, production was less than in 1969 period.

The higher prices of blocks forced a rise in prices of sticks and portions, which set records at the close of 1970. Concurrently, there was a decrease in disappearance of blocks, sticks, and portions in second-half 1970 compared to first half.

Two principal conditions will greatly influence the quantity of block imports and production and the sales of sticks and portions in 1971:

(1) the worldwide shortage of supplies of blocks, and

(2) the resultant high price levels.

GROUNDFISH

In 1970, supplies of groundfish fillets were 384 million pounds, 9% above 1969 and 18% above 1965-69 average. Landings of groundfish declined again in 1970--down 11% from 1969 to 92 million pounds (fillet weight). Imports continued to make greater inroads into U.S. markets. They increased 18% in 1970 to 245 million pounds and accounted for most of increase in supplies.

In the past 2 years, a discernible pattern of events has affected most groundfish species. In 1969, and especially 1970, prices in the economy became increasingly inflationary. Wholesale prices of groundfish fillets in the U.S. also rose, reflecting increasing costs of operation. High wholesale prices for fillets attracted heavier quantities of imported fillets--notably cod, flounders, and haddock. Imported products have been able to compete effectively with the domestic product because of lower production costs and because U.S. distributors considered imports a more stable source. An important reason for this stability was that supplies coming from several nations spread the risk of declining fisheries.

When a larger proportion of world fillet production was shipped to the U.S. in 1969 and 1970, a greater strain was placed on world

supplies. Greater fishing effort by exporting countries, along with rising costs, made these countries more dependent on high wholesale prices, such as those in the U.S.

Toward the end of 1970, wholesale prices began to level off as the economy cooled somewhat. The combination of scarcer supplies of some species (cod and haddock) and higher fillet prices, compared to other food items, accounted for a slowdown in consumption.

Although the demand for cod fillets has been bolstered by the burgeoning fish-and-chip outlets, scarce supplies and higher prices very possibly may cause buyers to resort to substitute species at lower prices. However, not all potential demand for cod fillets will be satisfied by substitutes, especially in institutional market.

In 1971, world supplies of cod fillets, and possibly pollock, may be diverted increasingly from the U.S. market. The United Kingdom and European Economic Community countries are likely prospects because of rising prices there.

The rise in wholesale prices of fillets in 1970 did not prevent consumption from reaching 333 million pounds, 9% above 1969. Cod-fillet consumption was constrained chiefly by supplies. Flounder and ocean-perch consumption may have been hurt in the latter part of 1970 by high prices.

Consumption of groundfish fillets is expected to be about 180 million pounds in first-half 1971; it was 181 million in first-half 1970. Flounder and ocean-perch consumption likely will rise, while consumption of cod, haddock, and pollock will fall.

World landings of cod are not expected to increase in 1971 and, possibly, may drop slightly in the next 2 years. A larger percentage of cod will be diverted to fillet production if--the potential demand for cod fillets in the U.S. generated by fish-and-chip franchises remains strong, and demand for sticks and portions levels off because of higher prices.

HALIBUT

Supplies of halibut decreased slightly in 1970 due to quota restrictions. Increased landings by U.S. vessels were offset by decreased imports.

Prices in 1970 were higher than in 1969, both wholesale and retail. Because of these higher prices, sales were a little low compared to previous years, and holdings at the end of 1970 were unusually high.

But a large increase in consumption in January 1971 ended fears of lower prices in 1971 because of decreased consumption and higher holdings in 1970. The outlook in 1971 is for firm prices and lower stocks.

WHITING

Supplies of whiting--headless and dressed--were 27 million pounds in 1970, 20% below 1969. Supplies have declined continuously for 5 years.

Consumption of whiting declined in 1970 following downward direction of available supplies. Consumption has also been down for

the last 2 years. With the prospect for low landings in 1970, processors paid high prices to fishermen to assure supply.

As a result of higher exvessel prices, wholesale prices rose. They began to attract substantial quantities of headless and dressed whiting from Argentina and South Africa. Prior to 1970, virtually all whiting were imported as blocks. Inventories of headless and dressed whiting began to build in summer 1970 as imports undersold domestic product.

To meet this competition, domestic processors began to lower wholesale prices, but exporters did likewise, and the price was still dropping in March 1971. Prospects in 1971 indicate that if wholesale prices continue to fall, imports will begin to shift back to blocks, especially because of the present U.S. shortage of blocks.

Consumption of headless and dressed whiting will probably continue to decline but, possibly, whiting in other forms--blocks and fillets--may take up some of slack.

SALMON

Salmon supplies were 2.2 million standard cases during first-half 1970, considerably lower than previous years. Canners and distributors made a concerted effort to reduce stocks during January through June to make room for anticipated record pack. Biologists had predicted a pack of 5.6 million standard cases, highest since 1941. The pack was larger than usual--3.9 million standard cases--but not a record. Salmon runs in Central and Southeastern Alaska fell below expectation.

Despite large pack, inventories were not excessive in second-half of 1970 and beginning of 1971. Prices for pink salmon were a little higher than 1969, reflecting relatively short stocks. Red salmon were plentiful, but prices remained firm.

The 1971 outlook is for a smaller salmon pack: 2.5 million standard cases, 36% below 1970, and 22% below most recent 5-year average. At beginning of 1971, inventories were not excessive. The industry is not unduly distressed about moving stocks in light of lower anticipated pack.

Prices should remain firm for red salmon and may even edge up for pinks. Consumption may rise slightly, primarily because of carryover from last year's large pack.

TUNA

Supplies of canned tuna increased substantially in 1970. Supplies were estimated at 505 million pounds, edible weight, 8% above 1969. U.S. tuna landings were a record 452 million pounds in 1970--also 8% above 1969. Imports totaled 313 million pounds, product weight, the 1969 level. Total production of canned tuna was 21.7 million standard cases in 1970--8.5% above 1969 pack.

Demand for canned tuna was strong during most of 1970; retail prices and per-capita consumption advanced. Exvessel and wholesale prices also increased sharply; albacore prices increased most rapidly.

In second-half 1970, and in early 1971, canned tuna was tested extensively for mercury. About 3.6% of U.S. domestic and imported

supplies was found to exceed the Food and Drug Administration's guideline of one-half part (.5) mercury per million parts of tuna. Tuna exceeding the guideline were withheld from sale or removed from market.

The outlook is for slightly higher prices and for recovering sales. It is possible that sales could be back to their long-run growth rate by midyear, if not sooner.

SARDINES

The domestic herring fishery continued to decline in 1970. Total supplies were 83 million pounds, 11% below 1969. U.S. landings decreased to 37 million pounds, about a third below 1969. The pack was below 20 million pounds for the first time in recent history of the fishery. Contributing to declining pack were low abundance, unpredictability of resource, and increasing use of imported sardines.

Imports of sardines increased slightly in 1970. But the category most competitive with U.S. pack--sardines in oil from Canada--more than doubled: 4.0 million pounds, compared with 1.9 million in 1969. Both wholesale and retail prices were up in 1970. Consumption was down, the decline mostly attributable to lower available supplies.

Prospects in 1971 are for a continued slight increase in imports, and a little lower consumption.

'DELAWARE II' ASSESSES SHELLFISH RESOURCES SOUTH OF NEW ENGLAND

The NMFS research vessel Delaware II defined and assessed resources along the continental slope south of New England from Dec. 18, 1970, through Feb. 26, 1971. The primary objectives of the 5-part cruise were:

1. To test and evaluate a system installed aboard the Delaware II for setting and hauling various pots in deep water.

2. Determine the species composition and distribution available to this fishing method during winter.

3. Gather biological information and samples of the catch; tag and release lobsters for migration studies; record and transmit hydrographic information.

4. Conduct test fishing with a variety of trapping devices (pots) along continental slope at 3 locations.

The scientists sampled at 3 primary locations off the Northeastern seaboard. Transects from about 100 to 600 fathoms were accomplished at Block, Hudson, and Baltimore Canyon (see map). All sampling was completed during January and February.

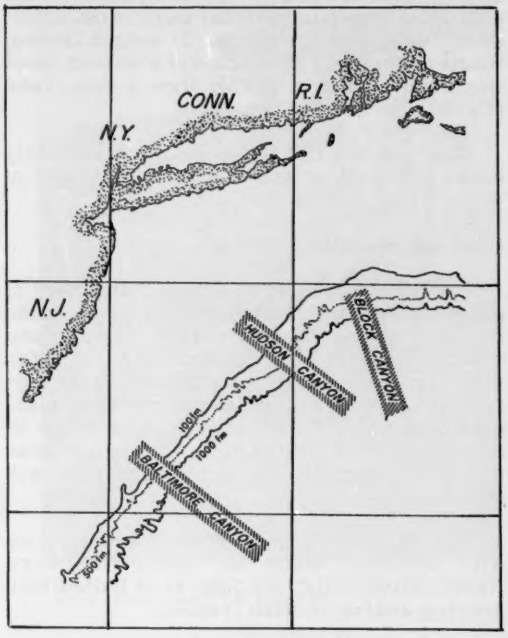


Fig. 1 - Areas of Operation.

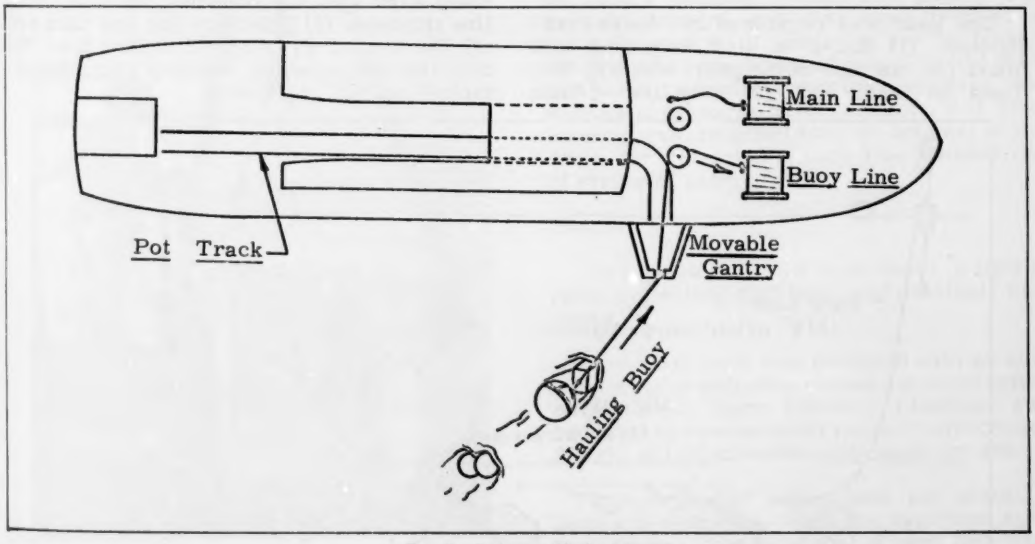


Fig. 2 - Delaware II's deck layout.

Three varieties of crustaceans comprised 92% of recorded catch of 20,103 pounds. Red crabs (Geryon quinquedens) were most abundant: 69% of total catch. In weight landed, lobster (Homarus americanus) was next most important species (13%); then Jonah crabs (Cancer borealis) 11%.

The remaining 7% were predominantly hakes (Urophycis sp.) and small amounts of other fishes and animals.

Gear and Handling System

To cover broadest spectrum, a variety of pot types were fished at most locations. These included steel, plastic-coated steel, and wooden lobster pots; cylindrical fish pots; wire-mesh shrimp pots, and west-coast king-crab pots. With exception of king-crab pots, all types were fished over a wide range of depths in sets of 10 to 50 pots. Strings of gear normally included one or more pots of each type.

Two king-crab pots, one standard and one with modified heads for taking fish, were fished individually. All pots were baited with herring and/or redfish frames.

Setting

The gear was organized into these components: (1) Buoys--a staff buoy with ball floats for one end of the gear, and only ball floats for other end. (2) Buoy line--$\frac{3}{4}$-inch polypropylene cored nylon braided rope. (3) Main line--$\frac{1}{2}$-inch galvanized wire rope. (4) Pots--lobster, shrimp, and fish traps.

The staff buoy was attached by 5 fathoms of polypropylene rope to a pair of inflatable ball floats. The buoy line, secured to this assembly, was divided into 50-fathom lengths to allow easy adjustment for many operational depths. The main wire was divided into 10-fathom lengths to permit changing number of pots fished on each set.

The sequence of operations during setting was: (1) Pots to be fished were baited and arranged in order in an open-ended skid-rack. (2) The vessel began steaming slowly along a predetermined track for setting the pots. (3) The buoy line was shackled to staff buoy and ball float assembly. (4) The staff buoy & ball float assembly was pushed out the stern ramp, followed by buoy line. (5) When enough buoy line had been set, the vessel was stopped. The buoy line was stopped off, disconnected, and the end of main wire was attached. (6) Then the main wire was set while steaming. A pot was attached to each 10-fathom length with a snap hook slipped over running line. The hook would snub against eye splice in each length of wire; the pot would be pulled overboard. (7) Again the vessel was stopped. The main wire was disconnected and more buoy line attached. (8) This buoy line was then set. (9) The vessel was stopped a third time, the buoy line disconnected, the buoy assembly attached and put overboard.

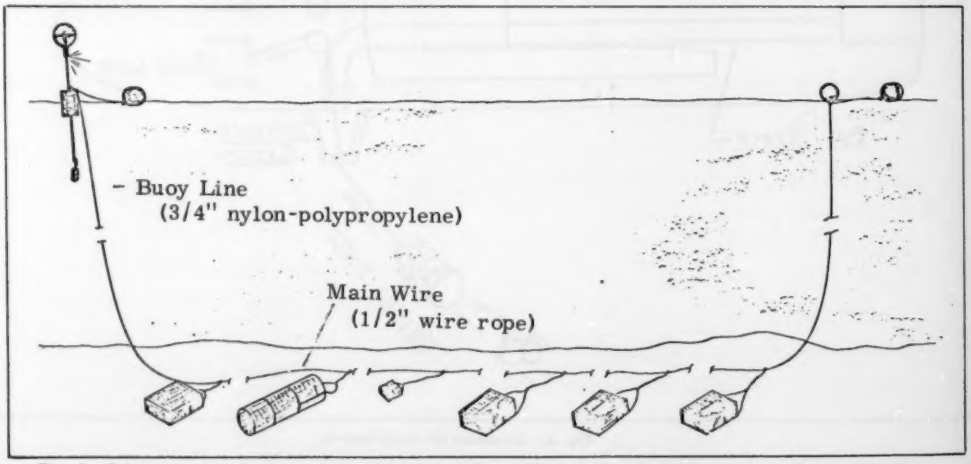


Fig. 3 - Schematic view showing arrangement of typical set. "Standard" sets usually consisted of a total of 20 pots, including 3 types lobster, shrimp, and fish pots.

Hauling

Hauling involved additional gear not used in setting. An opening in starboard bulwarks was used to bring pots aboard. A hydraulically powered movable gantry was mounted over opening. Two deck mounted fairlead blocks, one for buoy line and one for main line, provided leads to winch drums. A tensiometer was installed on one to provide an accurate gauge of load on buoy line. The rate of haul, therefore, could be adjusted to prevent excessive line tension.

The sequence of operations during haul back were: (1) The vessel approached buoy parallel with direction of set. (2) A grapnel was thrown over a floating line between staff buoy and ball floats. (3) A messenger line from starboard winch drum was passed through block at top of haulback gantry. (4) The buoy assembly was detached, hauled aboard, and carried aft for next set. (5) At same time, messenger line and buoy line were connected and hauling started. (6) When the buoy line was aboard, a messenger line from port winch drum was connected to main wire. (7) Buoy line was disconnected and hauling main wire with pots attached was started.

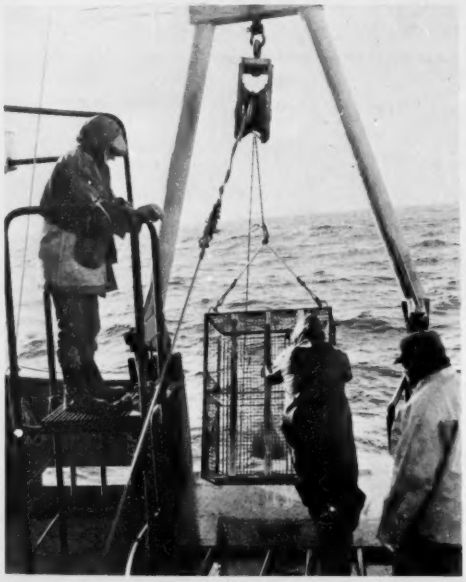


Fig. 4 - Lobster pot coming aboard Delaware II. Note moveable gantry and track (at bottom).

Fig. 5 - Stern area showing pots ready for launching off track. Note fairlead and buoy line.

(8) As hauling continued, the pots were brought to gantry hanging block. The gantry was brought inboard and pots were dropped on deck by action of gantry's arc of travel. (9) The pots were detached manually and skidded down racks for emptying, rebaiting, and storage in preparation for next set. (10) Then hauling was switched back to original winch drum for retrieval of buoy line at other end of string of gear.

Buoys

Two types of buoys were used: a lighted radar reflecting staff buoy, and inflatable ball floats.

The staff buoy was equipped with an aluminum radar reflector encased in a protective polyurethane foam sphere. Flotation was provided by a rectangular piece of styrofoam. Weight at bottom holds staff buoy upright.

The inflatable ball floats are about 20 inches in diameter. They are used with staff buoy to facilitate retrieval of gear (see Fig. 3).

Coverage and Results

Sixty-one sets were made ranging from 85 to 823 fathoms. Due to weather and other operational factors, the time each individual set was on bottom varied; the average soaking time was 21 hours.

The scientists sampled at three locations along continental shelf at Block, Hudson, and Baltimore Canyons. When possible, "standard sets" of 20 pot strings of gear were fished one or more times within each 100-fathom interval between 100 and 800 fathoms. Each set included lobster, shrimp, and fish pots. At some locations, standard sets were supplemented by sets using only lobster or king-crab pots.

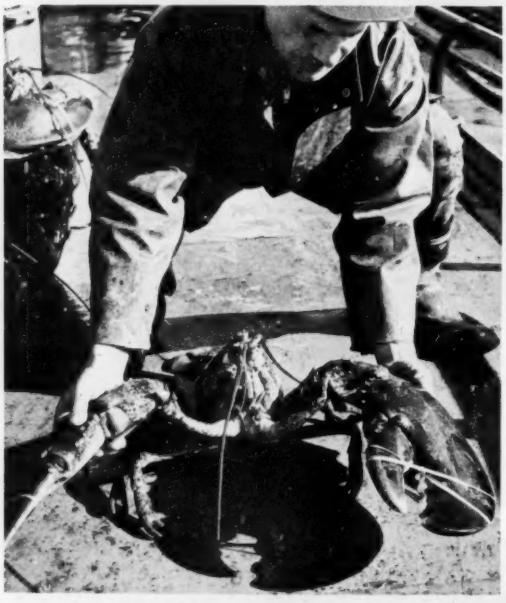


Fig. 6 - Large lobster weighing about 20 pounds. Average weight of lobsters was over 3 pounds.

During cruise, 23,607 hours of pot-effort were completed. This was 1,000 individual pot-days of effort. Of this total, over 83% was by lobster pots; the remainder fish pots (8%), shrimp pots (7%), and king-crab pots (1%). Geographically, effort was divided equally among the 3 canyons.

The total catch was over 20,000 pounds, most of this crustaceans. Small amounts of fish also were caught.

Red Crabs

The red crab was 69% of total catch. This is particularly significant because the greatest concentrations of red crab were in relatively deep water, over 250 fathoms, and received somewhat less coverage than shoaler depths. In areas sampled, the most dense concentration of red crabs was at 400-fathom depth contour near Hudson Canyon. Here, lobster pots averaged 122 pounds of red crab per pot-day; a single king-crab pot caught 714 pounds in an 18-hour set.

Good concentrations of red crabs also were found at Block and Baltimore Canyon sampling sites. The red crabs averaged about 1.2 pounds each and were found from 166 to 823 fathoms. There were consistently high concentrations between 250 and 500 fathoms.

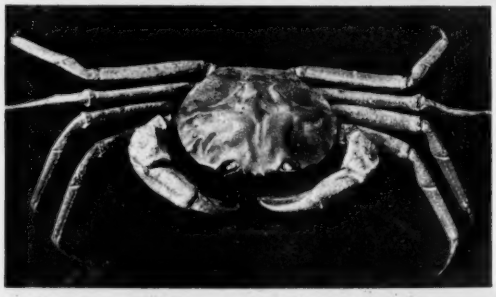


Fig. 7 - Red crab (Geryon quinquedens), the most abundant species caught. Occasionally reach over 2 lbs.
(Photos: W. F. Rathjen, NMFS, Woods Hole)

Table 1 - Fishing Effort by Canyon

AREA	No. Sets	Pot Hours Fished: Lobster	Shrimp	Fish	King Crab	Total	Percent
Block C.	18	5,975	661	785	96	7,517	31.8
Hudson C.	26	6,612	324	415	163	7,514	31.8
Baltimore C.	17	7,068	721	787	None	8,576	36.3
Totals	61	19,655	1,706	1,987	259	23,607	

Lobster

In weight, lobster catches were about 13% of total. They were caught at the three areas sampled from 85 to 300 fathoms. The best concentrations were between 150 and 200 fathoms at Baltimore and Hudson Canyons; there, lobster pots averaged about 6 pounds per pot during 24-hour periods.

Catch rates at shoaler and deeper depths were much less. Comparing the 3 areas sampled, the Baltimore Canyon provided the best catches. More than 800 lobsters averaging over 3 pounds were taken during cruise; of these, 326 were tagged and released for migration studies, the remainder preserved for research on stock identity.

Jonah Crabs

Jonah Crabs, which are similar to inshore rock crabs, were surprisingly abundant in observed catches. They were most plentiful in sets at less than 150 fathoms but were caught down to over 200 fathoms.

The best indications accounted for average catches of about 8 pounds per pot-day from lobster pots.

The observed depth ranges for the 3 predominant species of crustacea were:

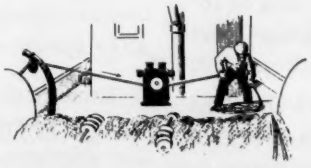
Table 2 - Depth Range of Crustacea

	Red Crabs		Lobsters		Jonah Crabs		Depth Fished	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	Fathoms							
Block C.	175	654	85	273	85	210	85	785
Hudson C.	185	823	151	300	98	212	98	823
Baltimore C.	166	583	89	293	89	200	89	583
Entire Cruise	166	823	85	300	85	212	85	823

Fish

Catches of fish with the gear used were uniformly light. Red and white hake (Urophycis sp.) were the most common species in depths less than 500 fathoms. Beyond 500 fathoms, frequent catches of deep-water sharks and blue hake (Antimora rostrata) were made.

For more information, contact Keith A. Smith, Base Director, NMFS, EF&GRB, Woods Hole, Massachusetts 02543.



VIMS STUDIES HERRING SPAWNING SITES & NURSERIES

Scientists of the Virginia Institute of Marine Science determined recently which areas of 4 major river systems serve as spawning and nursery grounds for river herring and shad. The largest is the Potomac River with 45,000 acres of mainstream and 16,000 acres in 40 creeks from both Virginia and Maryland.

The James River system ranks second with 41,000 total acres; 8,300 of these make up 104 major primary and secondary streams.

The Rappahannock River is third with 16,000 acres, including 1,860 in 56 tributaries.

The York-Pamunkey-Mattaponi river system is fourth with 11,000 acres, including 900 acres in 38 streams. Only the two major branches of the York River system serve as nurseries because the York proper is too salty.

How They Sampled

Sampling was done monthly at 5-mile intervals from mouth of each river to fall line to locate nursery areas. A 4-man field crew used gill nets, seines, and fyke nets to capture adult fish. It used plankton nets to locate the eggs and newly hatched larvae. Extensive collections of juveniles were made with surface and midwater Cobb trawls. The crew worked from onset of spawning season in the spring until juveniles left in fall; it sampled a single river system each year.

Determining Spawning Areas

If ripe adults were caught, the site was assumed to serve as spawning area. The same assumption was made where eggs or larvae were taken in plankton nets. At least two visits, and frequently more, were needed to confirm whether a tributary or site in mainstream served as spawning area.

River herring and shad spawning areas extend upstream from point where fresh and salt water meet. The study indicates that most river herring spawn in the freshwater reaches of tributaries and, to a lesser extent, in tidal freshwater portion of mainstream. Above the zone in each river where fresh water first meets salt water, nearly all streams could be listed as "probable" or "confirmed" spawning sites. However, extensive industrial and domestic pollution in James and Potomac rivers has made some spawning waters unsuitable.

American & Hickory Shad

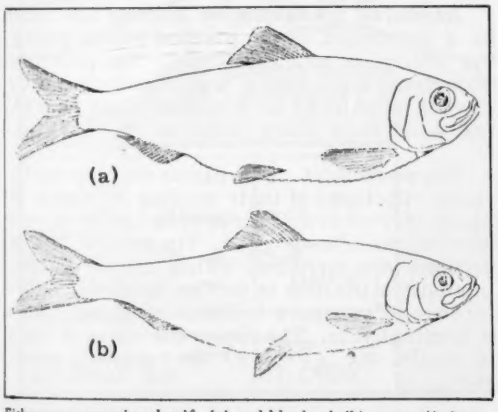
American shad prefer spawning on shallow-water flats of mainstream's tidal freshwater section. Most running-ripe spawners were captured on this area of the river. Shad also apparently spawn in tributary streams because shad larvae and young juveniles were found in upper reaches of tributaries shortly after spawning period.

Hickory shad also were found in running-ripe and spent condition in tributary streams and mainstream. These shad appear to run as far up mainstream as possible to spawn below first insurmountable barrier they meet. Hickory shad in spawning condition were taken below dam on Rappahannock River at Fredericksburg, at Walkers Dam on Chickahominy River, and below first dam at Richmond on

James River. Spawning hickory shad and river herring were captured in several tributary streams of these rivers.

Alewife & Shads

Alewife, hickory shad, and American shad enter Chesapeake Bay about same time in early spring. Blueback herring come later. Alewives have been reported in York-Pamunkey-Mattaponi river system in December and January. But earliest capture of alewives during VIMS study was in early February in James River system; surface-water temperature was 41°F. Alewives were found in spawning condition in tributary streams until mid-May. The height of spawning occurred during latter part of April, when surface-water temperatures ranged from 61° to 73° F.



Fishermen recognize alewife (a) and blueback (b) as two distinct kinds of river herring, but use several different names for them. Alewife is the deep bodied, big-eyed, greenbacked fish that runs early; blueback is the slender, small eyed, bluebacked fish that runs later.

Hickory Shad

The VIMS crews recorded earliest capture of hickory shad in York River system in late March; surface-water temperature was 50° F. These fish were found on spawning grounds with partially spent gonads until late May, when surface-water temperature was 73° F. Not enough were taken to determine peak spawning period.

American Shad & Blueback Herring

American shad enter Chesapeake Bay in March; height of spawning migration is in April. The earliest capture of ripe shad was in late March in Pamunkey River, when surface-water temperature was 50° F. Shad were found in spawning areas until late May, when water temperature was 67° F.

Blueback herring usually do not appear in the rivers until April; they remain until late May and early June. Most blueback spawning occurs in May when water temperature ranges from 64° F. to 75° F.

Males More Numerous

In all 4 species, the males generally are more numerous than females throughout spawning season; they also appear in the rivers earlier and stay later.

Starting in 1953, and continuing for 4 years, VIMS scientists investigated the effect of water temperatures on shad catches. They reported that almost no shad were caught below a water temperature of 40° F. Between 40° and 45° F, a few were caught. Largest catches were made in 45° to 59° F. At higher water temperatures, catches taper off but, even at 70° to 74° F, more shad were caught than at 39° F or less.

L.I. SHELLFISH THRIVE IN WEST INDIES EXPERIMENT

Oysters and clams shipped from Long Island Sound are being raised in St. Croix in the subtropical Virgin Islands in a bold effort to make use of what some have called the world's most important resource--the deep, cold, nutrient-rich water found in some parts of the world oceans. This was reported by Walter Sullivan in The New York Times on March 28.

The shellfish arrived in December 1970. Since then, their growth rate has been "absolutely fantastic," according to Dr. Arthur Chu, City University of New York, who is "mothering" the first crop.

I. Aquaculture

A larger plan, of which the shellfish experiment is one part, seeks to: explore the oceans' cold, deep layers for large-scale food production by "aquaculture"; generate power without pollution; extract moisture from trade winds to supply arid islands.

Antarctic Bottom Water

The Antarctic bottom water is the raw material for the plan. It originates in Antarctica's ice-clogged seas. It sinks beneath warmer waters of Atlantic, Pacific, and Indian Oceans. It inches northward until it crosses into Northern Hemisphere.

On its long voyage, the water gathers phosphates and nitrates from decayed marine life. It becomes remarkably fertile. And, where it surfaces--off Peru and West Africa, for example--oceanic life blooms.

Trying To Top Nature

The Virgin Islands experiment aims to stimulate and increase the upwelling phenomenon to propagate shellfish. The "longer-term prospect" is for use of the water's low temperature as a source of power and fresh water.

Three-quarters of the world's ocean water is colder than 50° F, state R. D. Gerard and Dr. A. O. Roels, Columbia University's Lamont-Doherty Geological Observatory. Much of it is just a few degrees above freezing. Because of its potential uses, they add, "it is obvious" that such waters are the planet's "most abundant resource."

St. Croix Experiment

A pipe has been laid from St. Croix's shore down to about 2,500 feet a mile off shore. Cold, nutrient-rich water is pumped into pools on shore. Cultures of one species of diatom, a microscopic form of algae, are put into the pools. The diatoms multiply until the water turns brown. Then they are passed through tanks with trays of oysters and clams.

The deep water is 50 times richer in phosphates and nitrates than surface water. The diatoms thrive--and so do the shellfish that eat them.

When the seed oysters and clams arrived in Dec. 1970, they were barely visible. They have been growing so fast that the scientists are looking forward to a summer feast.

In northern waters, oysters need 4 or 5 years to mature because they hibernate in winter and their diet is less rich.

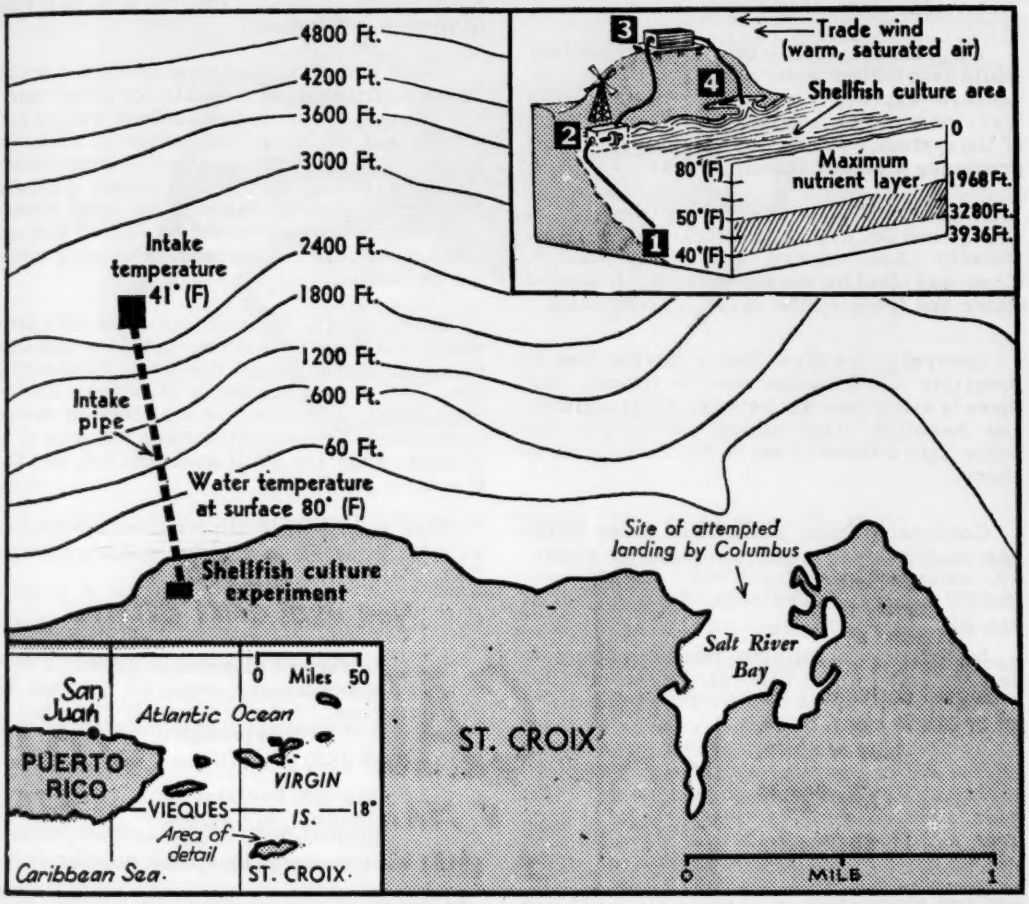
II. Power Plants

Intensive production of marine life could be a byproduct of the planned power plants, the Columbia scientists say. The principle underlying such plants was demonstrated by French engineers in a Cuban plant in 1930, and in Africa's Ivory Coast in 1950.

The success of steam plants depends partly on the efficiency of their cooling systems. A steam-driven destroyer moves faster in cold waters than in the tropics. The reason is that turbines are turned by a flow of steam. The intensity of the flow is determined by the difference in pressure between start and finish of heating cycle. The cooler the water at start of cycle, the g r e a t e r the resulting pressure.

The St. Croix system would be special. By using Antarctic bottom water, it would operate at a very low-starting pressure--and, as a result, at a very low temperature.

Air pressure on a mountain is lower than at sea level, so water there boils more readily. If pressure is low enough, water will boil at temperature of tropical sea water--about 80° F.



Cold, nutrient-rich water is pumped from ocean depths off St. Croix as a means to mass produce sea food, as depicted above. Inset diagram, upper right, shows related plan for extracting fresh water from the moist trade winds. Cold water, drawn from deep, nutrient layer (1) by windmill pump (2) is used in cooling condensers (3) that collect water from damp air. The oceanic cooling water is then fed into lagoon (4) where marine life is cultivated. Columbia University is conducting the experiments.

(The New York Times, March 26, 1971)

In the proposed St. Croix power plants, a temperature and pressure difference sufficient to drive turbines would be created by using the heat in warm surface waters. The cooling agent would be bottom water at about 50°.

III. Producing Fresh Water

To produce fresh water, the scientists would pass bottom water through hill-top condensers exposed to warm, moisture-laden trade winds. As wind strikes cold surfaces of the system, its moisture would condense--producing a steady trickle of fresh water.

A scheme like this was proposed by Mr. Gerard and Dr. J. Lamar Worzel of Lamont-Doherty Observatory. They noted that St. Croix was ideal for the experiment: it needed water and trade winds swept it continually.

Generally, the West Indies bar the flow of Antarctic bottom water into Caribbean. But there is a deep passage between Virgin Islands and Anguilla. This allows entrance of the water into a basin close to St. Croix's north shore.

Condensing fresh water from trade winds has an advantage over desalination plants. The latter extracting fresh water from the sea dump a highly saline residue. This endangers sea life.

In Gerard-Worzel plan, power to pump up deep water would be generated by windmills. The operation would be free of pollutants.

At present, the water drawn from depths off St. Croix pass through a pipe only $3\frac{1}{2}$" in diameter. When it reaches surface, it has been warmed considerably by sea's upper layers. If deep water is used as coolant, it will have to be pumped up quickly through a larger pipe.

Excelling Nature

The natural upwelling off Peru, which is responsible for rich fisheries, does not bring up the very deep water richest in nutrients, according to Gerard. The St. Croix experiment, reaching deeper into the sea, is trying to improve on nature.

Gerard and Roels have identified areas throughout the world suitable for deep-water exploitation. There, the surface waters are warm, and the deep, cold water is within 20 miles of shore. In a plan for large-scale aquaculture, they would instal conduits connecting coastal lagoons to deep water. Nutrient-rich water would be forced through these pipes into the lagoons. Pumping would not be needed.

In St. Croix, in pools enriched with deep water, the abundance of one-celled organisms reaches 10,000 times the level in adjoining sea. The organisms being grown are Cyclotella Nana, a diatom used as food in oyster hatcheries. The scientists are not sure it is suitable food for adult shellfish but, so far, it has been effective.

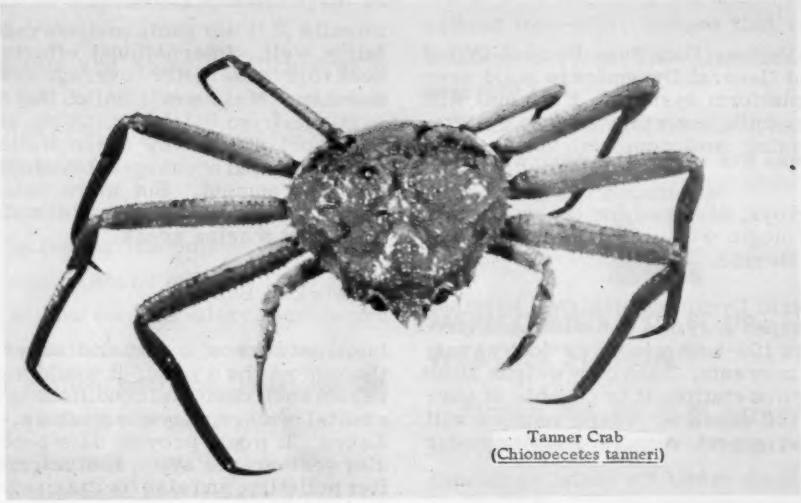
This may be first time individual species have been tested as food for maturing shellfish.

Culturing Diatoms

Each culture of diatoms is grown in succession of containers, each larger than the preceding one. In 8 days, one dropper full of diatoms proliferates enough to make a 12,000-gallon pool dirty brown.

The scientists are trying to learn enough about shellfish culture to assess its economic potential for many locations similar to St. Croix.

TANNER CRAB TAGGED SUCCESSFULLY FOR FIRST TIME



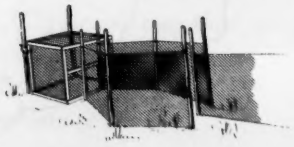
Tanner Crab
(Chionoecetes tanneri)

A small-scale tagging study by NMFS Auke Bay (Alaska) Biological Laboratory has developed a method for tagging tanner crab (Chionoecetes sp.) with a tag that will be retained through ecdysis (molting). John Karinen reports that of 9 male C. bairdi tagged with Floy anchor tags in the body musculature proximal to the third walking leg, 30% molted successfully and retained the tag; molting success of the controls was 90%. The biologists believe that molting success of tagged crab can be improved by modifying the tag and the insertion method.

Tanner May Come Home To Molt

The tagging program also has shown that tanner crab may return to a "home" area to molt and mate each year. SCUBA divers recently recovered a tagged male tanner crab in 30 feet of water at the Laboratory dock. It was one of 10 tagged in March 1970 and released at the same location. Tanner crab gather here each year to molt or mate and then return to deep water.

More tagging of tanner crab is underway to learn more about local movements and behavior.



OCEANOGRAPHY

ENVIRONMENTAL DATA BUOYS WILL BE TESTED IN GULF OF MEXICO

NOAA's National Data Buoy Project Office has selected General Dynamics to build several ocean platform systems. Each unit will have a buoy hull, moorings, power system, data-processing and communications systems.

These buoys, designed for oceanographic and meteorologic work, will be deployed in the Gulf of Mexico.

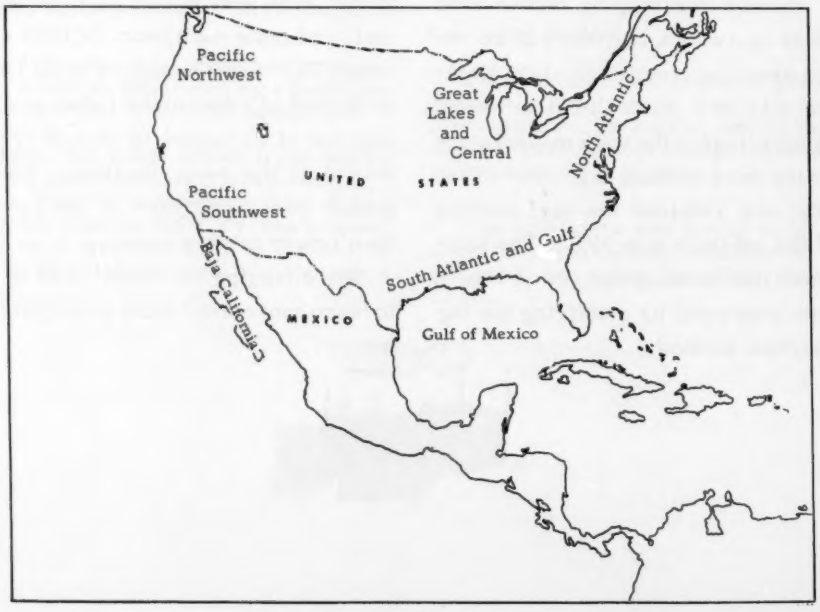
The General Dynamics-designed buoy has a discus-shaped hull and can withstand hurricanes with 150-knot winds, 60-foot waves, and 10-knot currents. Each buoy weighs about 100 tons when on station; it is capable of carrying over 100 sensors. These sensors will measure and report ocean and atmospheric conditions.

Long Needed

The buoys will fill the data gap in maritime areas. Inhabited regions are observed fairly well. International efforts currently seek to provide better coverage over land and oceans. "Measurements of the oceans are available from satellites, ships, and aircraft of opportunity, a few ocean station vessels, and occasional oceanographic ships sampling the environment. But more detailed information is needed on environmental conditions over vast marine areas."

Network of Buoys

A network of automatic buoys is needed throughout the oceans. It would measure and report environmental conditions in the oceans, coastal waters, bays, estuaries, and Great Lakes. It would provide data needed to predict weather, sea state, fish migration, monitor pollution, and also for marine transportation and other ocean-oriented industries. The World Weather Watch and the Integrated Global Ocean Station System programs may have someday a network of marine buoys and automatic land stations.



WARNINGS OF BAD WEATHER STRENGTHENED BY NEW DEVICE

Warnings of emergency weather from 12 radio weather stations along the U.S. Atlantic and Gulf coasts are being heightened by a special device called "tone-alert," which is being installed by NOAA's Weather Service on its UHF-FM stations.

The device transmits a signal that automatically increases the volume on special receivers within 40 to 50 miles of the station. Receivers without the tone-alert receive and broadcast a distinct 3-to-5-second tone just before the station operator transmits the emergency weather message.

When Device Is Used

The device is used immediately before special warnings of severe weather: tornadoes, hurricanes, winter storms, high winds, severe thunderstorms. These warnings are sent to hospitals, schools, civil disaster agencies, newspapers, TV and radio stations--and to those with radio receivers containing "weather band" at 162.550 or 163.275 megacycles.

U.S. Network Planned

In time, each UHF-FM weather radio stations of the Weather Service's nationwide network will have the alert device. The stations are part of NOAA's Natural Disaster Warning System.

The 24-hour-a-day stations transmit continuous weather forecasts and observations to farmers, sportsmen, boaters, and others needing reliable information. The regular flow of weather information is interrupted by hazardous-weather warnings.

Cost of Receivers

Equipment to receive the tone-alert is priced from about $150 upward. Receivers without tone-alert feature that can pick up Weather Service UHF transmissions start near $20.

The reception of transmissions, especially when low-cost receivers are used, depends on location and sensitivity.

MEXICO AND U.S. SET UP WEATHER STATION

Mexico and the U.S. have established a jointly funded weather station on Mexico's Guadalupe Island off Lower California. It is expected to improve warnings of storms threatening both countries.

The station makes upper-air observations to fill a need for atmospheric data from an ocean area that generates severe weather.

Upper-Air Reports

The upper-air reports made at Guadalupe Island are transmitted to the National Meteorological Center in Suitland, Md., by Mexican personnel who make observations twice a day. The reports are expected to offer valuable clues to the high-level steering currents that propel moist air inland from the Pacific and the Gulf of Mexico. ('Commerce Today', Mar. 8.)

ELECTRICAL SYSTEM WILL HELP DETECT MARINE POLLUTION

A system that will aid in detecting and controlling marine pollution has been devised and tested successfully by Texas A & M Sea Grant oceanographers. It is an electrical logging system that measures relatively quickly and cheaply the upper soft seabottom sediments. NOAA's National Sea Grant Program is supporting continued development and adaptation to computer techniques.

In-Place Gravity Probe

A main feature of the electrical system is an in-place gravity probe with electrodes in the nose. This is dropped into the soft bottom sediments. As it is withdrawn, it measures the electrical resistances of the sediments.

The oceanographers also have developed a device for obtaining the same measurements from cores. Also, they are showing how the electrical properties measured by either technique are related to some "chemical, physical, sedimentological, and engineering properties of the sediments."

Pollution detection is one of NOAA's responsibilities in monitoring the marine environment. Detection is vital to adequate pollution control. Bottom sediments are affected directly by changes in the kinds of particulate matter in the sea. Electrical logging techniques can record these changes.

Information obtained through logging also can benefit ocean engineering, mining, pipeline surveys, and basic research into bottom sediments.

System's Advantages

The oceanographers state that on-site measurement of electrical resistivities of sediments is a relatively quick and inexpensive way to determine some properties. Before, these could be measured only on shipboard, or in the lab, through subbottom samples gotten by the more painstaking technique of coring. Electrical logs will supplement, not replace, coring and reduce number of cores needed.

1969-70 Tests

Tests with probes 12 to 25 feet long were made in 1969 and 1970 south of Galveston, Texas, in northern terminal of Alaminos Canyon. In one series, electrical profiles were obtained in about 90 minutes of recording on the sea floor. Recovery of 30 cores from these stations would have taken about two weeks; analysis of their porosity and density would have taken months more.

Present Work

The oceanographers are building a new in-place device. With it, measurements will be made while probe is at the bottom. The device will end irregularities in pull-out caused by movement of the ship--and so increase accuracy appreciably.

NAVY SCIENTISTS DIVE AND WORK UNDER ARCTIC ICE COVER

Four oceanographers of the U.S. Naval Oceanographic Office (NOO) recently dived and worked under the Arctic ice mass less than 500 miles from the North Pole. NOO says the dives may be "the first extensive day-to-day operation ever conducted this far north."

The dives were made during a 10-day period in the 24-hour darkness of the Arctic night through a hole cut in 15 feet of sea ice adjacent to Fletcher's Ice Island. This is a floating 28-square-mile glacier. Since 1952, it has served as the site of an Arctic research laboratory for U.S.

The waters underlying the ice ranged in thickness from 15 to 60 feet. They were a constant 28.9 degrees Fahrenheit. Outside temperatures ranged from 20 to 39 degrees below zero. The first dive lasted 25 minutes; the longest was one hour, 55 minutes. The scientists reported that cold hands "were the principal factor limiting dive duration."

Their Purpose

The scientists were working to establish techniques for making scientific observations, especially measuring and profiling the underside of the ice cover. They photographed the ice with still and motion-picture cameras. They profiled a part of the underwater ice mass by direct measurement with tapes, measuring rods, and a recording slate.

"We were particularly interested in measuring and recording on film the juncture of Fletcher's Island with the adjacent sea ice," they said.

Value of Work

Oceanographers-divers can only provide information on a small part of undersea ice at any one time, NOO states, as opposed to wide-ranging surface techniques, such as aerial photography. But divers' data will be useful in relating "the bottom side with the top. If we know this general relationship, we can then infer what the bottom side looks like from our surface observations." A complete picture of ice structure will help NOO oceanographers predict movement of sea ice for the benefit of shipping in the Arctic and the Antarctic.

NOO's oceanographers provided much initial data that helped to insure a safe voyage for the 'Manhattan'. The world's largest oil tanker-icebreaker successfully navigated the icebound Northwest Passage in fall 1969.

OCEANOGRAPHERS HUNT EARTH'S OLDEST CRUST IN SOUTH PACIFIC

NOAA oceanographers aboard the 'Surveyor' are making a 6800-mile trip in April-May from American Samoa to South America seeking what may be the oldest part of the earth's crust in this area.

The Seattle-based vessel, operated by NOAA's National Ocean Survey, conducted a hydrographic survey of the approaches to Pago Pago Harbor in American Samoa before beginning the $3\frac{1}{2}$-week oceanographic expedition.

A Giant Chasm

Barrett H. Erickson, the project's chief scientist, said: "Although the undersea structural features in this part of the South Pacific are now poorly known, it seems that the oldest oceanic crust in this area may lie just east of the southern Tonga Trench." This great chasm in the seabed descends more than 6 miles below the sea surface; it extends south of the Samoan Islands toward New Zealand.

Erickson added: "A study of the geophysical characteristics of the oceanic crust between the Tonga Trench and the East Pacific Rise should provide evidence on the age and history of the oceanic crust in this area." The East Pacific Rise is a mile-high underwater mountain range lying in water almost 2 miles deep It parallels the northwest coast of South America.

The Surveyor expedition is part of NOAA's long-range program to investigate the sea bottom and to illumine the earth's history.

RECREATIONAL BOATING IS EXPANDING RAPIDLY

In 1970, recreational boating in the U.S. involved an estimated 44,070,000 persons who spent about $3,440,000,000. So reports the National Association of Engine and Boat Manufacturers.

The pastime has grown greatly. The industry estimates there were 8,814,000 recreational boats in the U.S. in 1970; 4,864,074 were registered by states and the Coast Guard. The boats ranged from plush sailing craft and sleek motor jobs to rowboats, prams, and dinghies.

Housing Them

The boatmen were from 5,900 marinas, boatyards, and yacht clubs. They hauled their craft to the water aboard 3,700,000 homemade and factory-produced boat trailers.

Industry's Growth

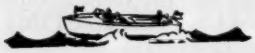
There were an estimated 3,510,000 recreational boats in 1950; in 1970, 8,814,000. Total expenditure jumped from $680,000,000 to nearly $3.5 billion.

Outboard Motors

An estimated 7,215,000 outboard motors were being used in 1970.

The skilled worker is the heaviest buyer of outboard motors: 24.5% of them. The professional was second with 17.6%. Clerical and sales people were third with 17.2%. Only 2% of factory workers bought outboard motors during the year.

The New York City area led in outboard motor use with 316,000. The average length of motor boats purchased in one 12-month period is listed as 15.4 feet; the greatest number (43%) run from 14.7 to 16.6 feet.



TELL COAST GUARD WHEN HELP NO LONGER NEEDED, CAPTAINS URGED

Fishing vessels calling for emergency aid should notify Coast Guard immediately when assistance is no longer needed, the Search and Rescue Branch of the First Coast Guard District has urgently requested. The Fishing Vessel Safety Division of the National Marine Fisheries Service joins in this appeal.

Over 300 commercial fishing vessels from Maine, Massachusetts, and Rhode Island ports are aided each year by Coast Guard cutters, aircraft, and bases located from Eastport to Block Island. While most Coast Guard missions are completed safely, some vessels solve their own difficulties while help is on the way. These vessels continue their trips without notifying the Coast Guard.

A Wild-Goose Chase

This happened recently when a Gloucester (Mass.) trawler called for Coast Guard assistance while disabled in the Gulf of Maine. Coast Guard search and rescue units raced to assist the stricken craft. When they arrived at the reported location, there was no trace of the vessel. A long search of the area ended when the vessel was reported safely tied up in Gloucester harbor.

OKLAHOMA SCIENTISTS SEEK ANTIBACTERIAL AGENTS IN CORAL

NOAA has awarded a $161,800 Sea Grant to inland Oklahoma University for marine pharmacology work. Chemists under Dr. Alfred Weinheimer will isolate and try to produce useful compounds that demonstrate antibacterial, or similar effects, from coral and other marine invertebrates.

The Oklahoma marine-chemistry program is more than 15 years old. It has studied the extractable organic chemical content of several abundant coral-reef invertebrates from the Caribbean and other waters. The scientists have observed that many extracts demonstrate antibacterial activities of possible benefit to man. Recent experiments showed a high degree of antitumor and antileukemia action among certain compounds.

Practical Production Methods Sought

With the NOAA Sea Grant, the researchers hope to develop practical methods for producing useful compounds in quantity. They will give special attention to those aspects showing potential as anticancer agents.

The Oklahoma researchers collect tropical and subtropical invertebrates several times each year, mainly in the Caribbean. They have studied corals, sponges, and other materials.

The program is part of NOAA's Sea Grant effort in marine pharmaceuticals. In December 1970, NOAA awarded a Sea Grant to Osborn Laboratories of Marine Sciences of the New York Zoological Society to extract and test antibacterial agents from sponges.

SEA GRANTS FOR COASTAL-ZONE PLANNING, RESEARCH & TRAINING

NOAA has awarded $207,500 worth of Sea Grants for coastal-zone planning, for research, and for training:

1) $139,200, in 2-year project, to Nassau-Suffolk Regional Planning Board, Hauppauge, New York, to develop methods for planning the best use of coastal-zone marine resources. The project "will identify, classify, and analyze problems confronting decision makers dealing with marine resources."

2) A $50,000 Sea Grant to Lamont-Doherty Geological Observatory of Columbia University to continue its artificial upwelling project in the Virgin Islands. (See p. 16.)

The major emphasis during the next year will be on "food from the sea". This involves the growth of plankton and selected commercially valuable organisms.

3) The University of New Hampshire, Durham, was awarded $18,300 to give engineering students experience in the parts and systems used in ocean-oriented projects.

Students will continue to work on such projects as underwater life-support systems, shallow-water coring, and underwater tools. Each project is conducted by a team of students under one or more faculty members. In the project's first two years, 52 undergraduate and 17 engineering faculty members participated.

The 3 institutions will match at least half the NOAA Sea Grant with non-Federal funds.

LAMPRICIDE STUDY

A chemical used in Lake Michigan and Lake Superior to control sea lamprey--TFM--will be studied systematically for the first time by pharmacologists of the Medical College of Wisconsin, Milwaukee. NOAA has awarded it a $26,500 Sea Grant to study the metabolism and pharmacology of 3-trifluoromethyl-4-nitrophenol.

TFM is a selective lampricidal agent that has been effective in destroying the sea lamprey during its early development. Two or 3 parts of TFM in a million parts of water are lethal to sea lamprey larvae, while not affecting most other fish and aquatic species.

TFM's Achievement

Since TFM's introduction, the population of lake trout and white fish has increased substantially. The lamprey had nearly wiped out these fishes.

However, very little is known of how TFM works and what happens to it after it has done its job. No definitive studies have been made of TFM's pharmacology, metabolic fate in fish and mammals, and its possible environmental effects.

That is what the Medical College of Wisconsin will do.

STUDY CIGUATERA POISONING

Ciguatera poisoning, a tropical malady of humans and fish, will be investigated under a NOAA Sea Grant to the Caribbean Research Institute, College of the Virgin Islands, St. Thomas. Tropical islanders around the world fear the malady.

Dr. Robert W. Brody will seek to determine patterns of infection and food-chain relationships, and conduct laboratory analysis of the poison.

A Ciguatera Case Repository will be set up to gather clinical and pathological data from human cases.

Serious Problem

Ciguatera fish poisoning is a serious public health problem in the northern Leeward-Virgin Islands area. It slows the growth of the fishing industry so much that local fisheries provide only about 50% of the fish protein eaten.

The malady, apparently concentrated in tropical islands, has little effect on continental areas. It has been studied in the Pacific since World War II. There it is linked to a shallow-water food chain. The Caribbean scientists will be in close communication with University of Hawaii researchers.

Published Reports

About 4,500 persons in the world have had the illness since it was first identified; 542 deaths have been recorded. It affects the gastrointestinal and nervous systems. It usually develops 3 to 5 hours after an infected fish has been eaten.

FAO will cooperate with Sea Grant project. Its fishing vessel 'Alcyon' will provide fish samples and other data. NOAA's NMFS laboratory at Seattle, Wash., will also participate. It will provide chemical services in extracting and purifying the toxin.

Information Program

Medical reporting of ciguatera poisoning in the Virgin Islands is presently spotty. Individuals who become affected apparently seldom seek medical help. To obtain better data on symptoms and on suspect fish, the Sea Grant scientists plan to conduct an information program in the Virgin Islands. This will include TV and a brochure similar to one used in Japan and the U.S. trust territories to encourage people to report to medical authorities when they suspect that they have ciguatera poisoning.

TEXAS LAB TO PRESCRIBE MEDICINE FOR FISH IN MARICULTURE

Texas A&M University opened its new Aquatic Animal Medicine Laboratory January 11. The university says its College of Veterinary Medicine is the only one in the U.S. that has a medical-care program for marine animals.

"What we hope to do is be able to produce a cheaper and better seafood product," says Dr. George W. Klontz, associate professor of veterinary medicine, who is in charge of the lab.

Need for Mariculture

Ocean fishing is largely a hunter-type operation, Dr. Klontz adds. The ocean is being drained of its resources, and industry must devise more effective ways to produce food from the sea.

In mariculture, propagation in captivity of marine life, ocean water can be directed into ponds and the "livestock" cultivated.

"An example is a two-acre pond," Dr. Klontz notes. "You run sea water in one end, through the pond, and out the other end back to the sea. You stock the pond with fish, feed them and harvest them."

Disease Is Major Problem

A major problem so far with mariculture is contraction of disease.

"Of all animals presently being hatched in captivity, 25 to 50 percent don't get to the market because of disease," he says. "In some cases it runs even higher, but that's a good estimate."

Also, 30 cents of every dollar spent in mariculture enterprises goes to disease control.

12 Species For Lab

When the laboratory is stocked, Dr. Klontz says, 12 species of fish will be available for study and experimentation. Two species, albino catfish and Gulf topminnows, already are swimming nervously in 4 separate tanks.

He says the albinos were used because of their genetic homegeneity for measuring responses to viruses and bacteria; the topminnows for measuring a large spectrum of responses.

"These are our lab animals," he notes. "When commercial propagation of fishes becomes a reality, we hope to be ready to help when the diseases occur."

Lab Supports Sea Grants

The new laboratory will support the work of 4 Sea Grant projects in marine fisheries. The studies focus on bacteria and viral diseases of marine fish and shellfish, parasitic relationships, and histopathological studies of inflammation in fish.

Cooperative work with the Texas Parks and Wildlife Department also will be conducted.

Dr. Klontz points out that the university has the only vet college in the U.S. offering formal instruction in aquatic animals medicine at the preprofessional and graduate levels.

AT&T MAKES PROGRESS IN PROTECTING SUBMARINE CABLES

A 12-year effort by American Telephone and Telegraph Company's Long Lines Department to prevent fishermen from snapping submarine cables between U.S. and Europe is beginning to pay off. This is reported by New England Marine Resources Program.

The breaks are caused by snarling of gear in the cables. When these occur, hundreds of voices are silenced; repairs cost hundreds of thousands of dollars.

To ease problem, AT&T has: appealed to the fishing industry; offered free charts and brochures pinpointing the cables; offered to pay fishermen for nets and fouled gear that have to be cut away to avoid damage to a snagged underseas cable; maintained a North Atlantic patrol to warn trawlers away from cable routes; developed equipment and techniques that enable company to bury cable two feet under ocean floor, safe from commercial fishing tackle or natural disasters.

70 Cable Failures

In the past 15 years, there were 70 cable failures on the 4 transatlantic telephone cables; 54 were on this side of Atlantic. Two were caused by icebergs, the remainder by trawlers or scallopers. AT&T feels that elimination of breaks caused by fishing is key to preventing cable failures. AT&T says it can no longer depend on selecting routes to avoid fishing grounds because fishing areas have extended considerably in the past 12 years and have overrun new cables. Routes that were free of trawling when cables were placed are now vulnerable.

TATS 1-5

The first transoceanic telephone cable system, TAT-1, was put into service in 1956. Since then, 4 more have been placed along ocean floor. When TATS 1 through 4 were in planning stage, prime importance was given to routes outside fishing grounds. TAT-1 was charted north of Grand Banks in Newfoundland, where fishing mainly for cod was heavy. A change in fishing methods and consumer tastes in the late 1950s drew trawlers farther north, where cables were located. Soviet fleets with refrigerated trawlers began to process ocean perch, a highly perishable catch formerly ignored by fishermen. Eventually, trawlers from 13 other nations began fishing near the cable routes.

A Break In 1959

"The first break in service occurred in February, 1959, when a Russian trawler accidentally snagged TAT-1," AT&T stated. Its air patrols began that month to augment ship patrols designed to warn trawler captains when they are too near a cable. Two ships patrol Cabot Strait and the North Atlantic trawling area; they are ready to repair a snapped cable. The air patrols drop leaflets printed in 6 languages warning captains of their closeness to submarine cables. Cooperation has been good.

'Shoes' Kick Cables

It isn't the trawling nets themselves that cause the cable breaks. The 'culprit' is the large oak and metal "shoes," called otter

boards, which scrape along ocean bottom holding open the great nets. If otter board scoops up cable instead of riding over it, the cable is likely to be snapped.

In 1965, Woods Hole Oceanographic Institution, Cape Cod, Mass., discovered a rich scallop bed off New Jersey through which a cable had been placed. New England and Canadian fishermen converged on the area. Cable breaks became numerous, mostly from scallop dredges being dragged repeatedly across bottom. In one instance, 7 miles of cable had to be replaced and, in one period, repairs cost over $350,000.

Going Underground

This was when AT&T was trying to convince fishermen to weld a small metal addition to their dredges between the shoe and the dragging frame. This would allow gear to slide up and over a cable instead of hooking onto it. This did not eliminate problem, so AT&T solved it by burying sections of new cables near this area in 1966. It was the first underground cable along an ocean bottom.

Working cable into the ocean floor is always preceded by an oceanographic survey. A Bell-designed, 7,000-pound survey vehicle with communications and measuring instruments collects underwater information. Towed by a cable ship, this vehicle has a weighted steel wheel to cut through the soil.

Cooperation With Fishermen

AT&T is asking fishermen to help where cable lines lie exposed on ocean floors, and where it is impossible or impractical to bury the cable. Its charts are highly detailed and show exact cable positions. AT&T points out that snagging cables can also be costly to fishermen. Fishermen have lost fishing time and up to $8,000. The company is willing to replace snarled nets. It has done so 12 times at a cost of about $2,000 each time.

AT&T emphasizes danger fishermen expose themselves to when they cut cables to free meshed gear. Telephone cables carry up to 5,000 volts of electricity, considerably higher than telegraph cables.

Successful Burial

The successful burying of cable has increased reliability of international communications. It has reduced AT&T patrol and repair costs from fishing damage or natural events--undersea landslides, icebergs, currents, surf action, and rough ocean-bottom conditions. Shorter cable routes are possible because commercial fishing locations do not have to be circumvented.

CALIFORNIA'S GIANT KELP

In 1968, the California Legislature directed the Department of Fish and Game to prepare "a comprehensive master inventory and preliminary master plan for utilization of all ocean fish resources from existing scientific information. . . ."

The deadline was the 5th legislative day of the 1971 Regular Session. The department has prepared "California's Living Marine Resources And Their Utilization," a 148-page work. "It concerns itself primarily with the living marine resources that enhance the wealth of this State and provide for recreational benefits for the people. It does consider some of the effects of man's activities in coastal areas of California as well as some problems confronting the State's fishing industries."

The following is reprinted from the California publication:

History of the Harvest

Marine plants have been used in many parts of the world for hundreds of years as a food supplement for humans and animals. The giant kelp, Macrocystis, has been harvested commercially and processed in California since 1910. Except for a few innovations to reduce spillage and speed up the cutting and loading process, kelp still is harvested as it was over 50 years ago.

Kelp contains carbohydrates, minerals, vitamins, and algin or alginic acid. During World War I, potash, acetone, and iodine were the chief products recovered from kelp. Kelp meal, used as an animal food supplement, and algin, used in many modern products, are the most important items today.

Algin, a colloidal substance extracted from kelp, has the unique property of absorbing large quantities of water. This property makes it important in preparing commercial ice cream since it prevents water from forming coarse ice crystals. Algin also has suspending, stabilizing, emulsifying, gel-producing, film-forming, and colloid-forming properties which render it valuable in other processes. It is used in pharmaceuticals to suspend drugs and antibiotics such as penicillin. Algin is important in the preparation of adhesives for containers, coatings for welding rods, and to hold fiberglass mats together. The textile industry uses it for thickening and stabilizing dyes. At present, there are more than 200 uses for algin.

The annual California kelp harvest has varied from a high of 395,000 wet tons in 1918 to a low of 260 tons in 1931, but averaged 129,000 wet tons during the 10-year period (1960-1969). No adverse influence on the rich fauna associated with kelp beds can be attributed to harvesting as currently practiced.

Kelp beds are numbered and designated beds may be leased for a 20-year period. Commercial kelp harvesters may lease two-thirds of the kelp beds in California; however,

the remaining one-third is not leased and may be harvested by any company. These are called open beds. Commercial harvesters bid for the privilege of exclusive use of leased beds. A single entrepreneur may not lease more than a total of 25 square miles or 50 percent of the total kelp areas, whichever is greater. Every harvester must purchase an annual license and pay a royalty per ton of wet kelp harvested. Over or under harvesting a leased bed constitutes a violation of the lease agreement, and a fine and loss of the exclusive lease can occur.

Giant kelp is harvested by specially built barges. These vary in size and some are capable of carrying up to 300 tons of wet kelp. Kelp is cut to a maximum depth of 4 feet (by regulation) below the water's surface and is transferred by a conveyor belt into the open hold of the barge. It then is transported to a processing plant where it is transformed to a salable product.

Status of Biological Knowledge

Giant kelp ranges from Sitka, Alaska, southward to Pt. Abreojos, Baja California; nevertheless, kelp harvesting has been centered in southern California. Kelp grows in water from just outside the surf to depths of 100 feet. The plant has a root-like structure called a holdfast which clings to a hard rock or shale substrate.

Giant kelp is a perennial, living and sending up new stalks called stipes for a period of 5 to 10 years. These stipes reach the surface to form a canopy, and live for about 6 months. There is a constant succession of new stipes growing to the surface to replace dead and dying ones, and a single holdfast may have more than 100 stipes. A young plant takes about 1 year to become established. Under favorable conditions, a young plant will double in size every 3 weeks. Growth and reproduction are limited by the available light (water clarity and depth), temperature, amount of available rocky substrate, nutrients present, number of grazers in area (opaleye, sea urchins, abalone, and other gastropods), disease (black rot), storms, and by heated water discharges and sewage outflows in the area.

Growth is primarily from the terminal tips of the stipes. Nutrients are taken from the surrounding water in the presence of sunlight during the process of photosynthesis. Rapid growth may follow an increase in the amount of plant food present in the water. During periods of optimum conditions, which consist of clear, cool waters, below 66° F, enriched with nutrients upwelled to the surface, giant kelp stipes have been observed to grow from 12 to 24 inches in a single day. When water temperatures reach 66° F, growth is arrested and sloughing occurs.

Giant kelp has a fascinating reproductive system. There are two different forms in the life cycle of the species. The sporophytes (the large plants making up the kelp beds) liberate billions of spores which give rise to microscopic plants known as gametophytes. The male and female gametophytes in turn give rise to sporophytes. The reproductive tissue of the sporophyte is located in specialized blades at the base of the plant. While individual plants fruit at specific times during the year, within any one kelp bed reproduction occurs throughout the year.

Grazers, such as sea urchins, may have a tremendous impact on kelp beds when ecological conditions permit their populations to reach large numbers. Environmental conditions created by sewage outfalls in southern California have led to the establishment of large urchin populations in certain areas. Urchins not only destroy the existing kelp, but keep young plants from becoming established. Once the kelp is gone, the urchins are able to survive by living off the sewage discharge nutrients. Research indicates an urchin also may absorb up to 50 percent of its minimum daily nutrient requirements from the surrounding water. In this manner, large urchin populations continue to exist in areas that formerly contained kelp beds.

Kelp beds can be restored. Sea urchin populations can be controlled by man. The kelp bed at Point Loma, near San Diego, has been restored almost to the same size it was 20 years ago. In addition to physically or chemically killing the sea urchins, several other techniques have been developed to assist in kelp restoration. Juvenile plants have been cultured in the laboratory and planted at suitable sites. Adult plants have been transplanted. Work is underway to develop mass culture techniques. Spore production and dispersal rates have been studied, and light requirements of the microscopic stages of kelp are being investigated. Efforts continue to upgrade water conditions along the coast.

One side effect of disappearing kelp beds is the loss of fish habitat. Areas that once sustained considerable sport and partyboat fishing pressures now provide very little support to these fisheries. Unfortunately, loss of kelp beds has been the largest in areas where fishing pressures are the greatest. In these same areas, the need for high aesthetic values in the inshore marine environment is possibly the greatest in California because of their proximity to large metropolitian areas.

Status of Population

California kelp beds have decreased in size since the early 1900's when they covered approximately 100 square miles. Today they cover less than 75 square miles. There are 74 designated kelp beds along the California coastline. These cover 53.86 square miles south of Point Conception, including the offshore islands, and 15.5 square miles between Point Conception and Point Montara. In the last 10 years, some of the major kelp beds of southern California have all but disappeared due to temperature changes, sewage discharges, and kelp grazers. Kelp habitat improvement projects, initiated in 1963 by industry and the academic society, have restored the Point Loma kelp bed near San Diego to a point where it again can sustain a commercial harvest. Increased numbers of heated water discharges could pose a threat to the kelp resources of California in the future unless special effort is made to keep the warm effluent away from kelp beds.

SEASONAL AND GEOGRAPHIC CHARACTERISTICS OF FISHERY RESOURCES

California Current Region--V. Northern Anchovy

David Kramer and Paul E. Smith

The resource of the northern anchovy, Engraulis mordax, off the coasts of California and Baja California has been estimated to have grown from 640,000 tons in 1951 to a spawning biomass fluctuating between 5 and 8 million tons since 1962 (Smith, MS). (Estimates from various sources, 1940-41 to 1965, were compiled by Messersmith in 1969--Table 2.) The growth has been attributed, in part, to the anchovy's occupation of the niche left empty by the Pacific sardine during its decline. In 1966, Ahlstrom depicted this phenomenon in comparing the relative abundance and distribution of the larvae of the two species for 1954 and 1962 (Figs. 1 and 2). Data from fossil scales, presented by Soutar (1967) and Soutar and Isaacs (1969), offer an alternate explanation to the anchovy's filling the sardine's niche. They imply that fluctuations in the populations of these two species may have been independent of one another in different periods over the last 2,000 years.

In 1964, the California Cooperative Oceanic Fisheries Investigations (CalCOFI) Committee proposed to the California Marine Research (MRC) Committee that a 200,000-ton harvest be allowed for reduction purposes on the hypothesis that a fishery for this species might help to restore the sardine resource; once restored, proper management could maintain a balance between the two resources. This was detailed by Messersmith in 1969.

Seasonal and Geographic Distribution

Two sources of information are available on the seasonal and geographic distribution of the anchovy population. One is a tagging study in 1966-69: the California Department of Fish and Game (CF&G) tagged anchovies from San Francisco, California, to Ensenada, Baja California, to determine their migratory habits and to obtain estimates of their population size and mortality rates (Haugen, Messersmith and Wickwire, 1969). Recoveries of tags indicated northerly movement during late summer and southerly movement during the winter. The data were insufficient to determine the sizes of the population mortality rates, or total distribution, because of the low level of the reduction fishery during that period of the study and lack of catch statistics south of Ensenada.

Vrooman and Smith (MS), using serological data, estimated the same movements in a central subpopulation of the anchovy between Pt. Conception, California, and Cedros Island, off Baja California. This subpopulation is included in the area depicted by Haugen, et al. (1969) for their tagging work.

The second source are the data of the CalCOFI, which show the seasonal and geographic distributions of anchovy larvae, cruise by cruise, for 1951-65 (Kramer and Ahlstrom, 1968), and in summaries for eggs and larvae for 1951-60 (Figs. 3 and 4) over the full range of the investigations.

Summarized data can be used to predict the times and locations of adult fish spawning as described by Kramer and Smith (1970a) in the first report in this series, where the organizations, area of investigations, and treatment of the data were presented.

Unlike our previous reports, which used either all eggs or all larvae for the summaries (Kramer and Smith, 1970a, b, c, d), we are using both for the anchovy; for the larvae, we are using the 5-mm size only, the most abundant in the plankton hauls.

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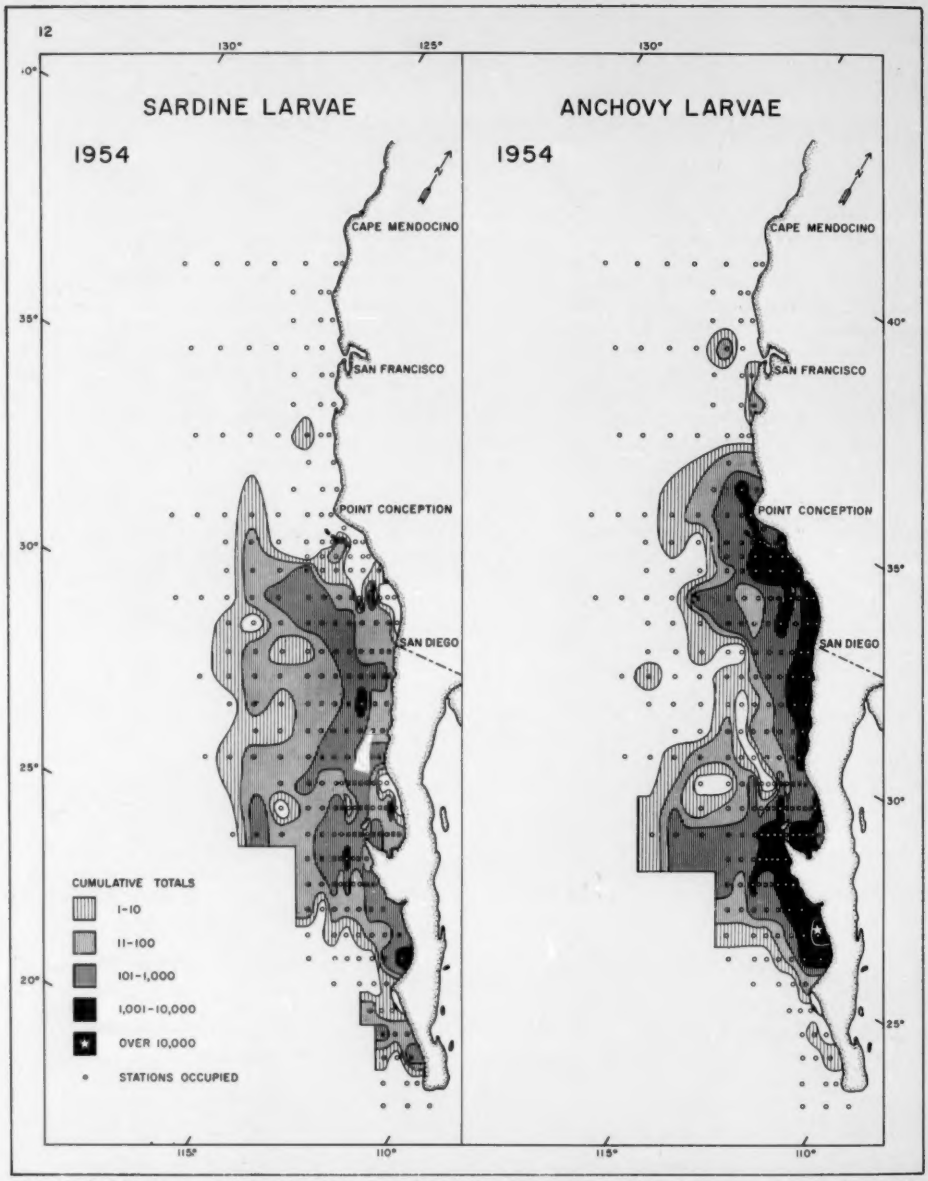


Fig. 1 - Distribution and relative abundance of sardine and anchovy larvae in 1954 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). (Fig. 2 of Ahlstrom, 1966.)

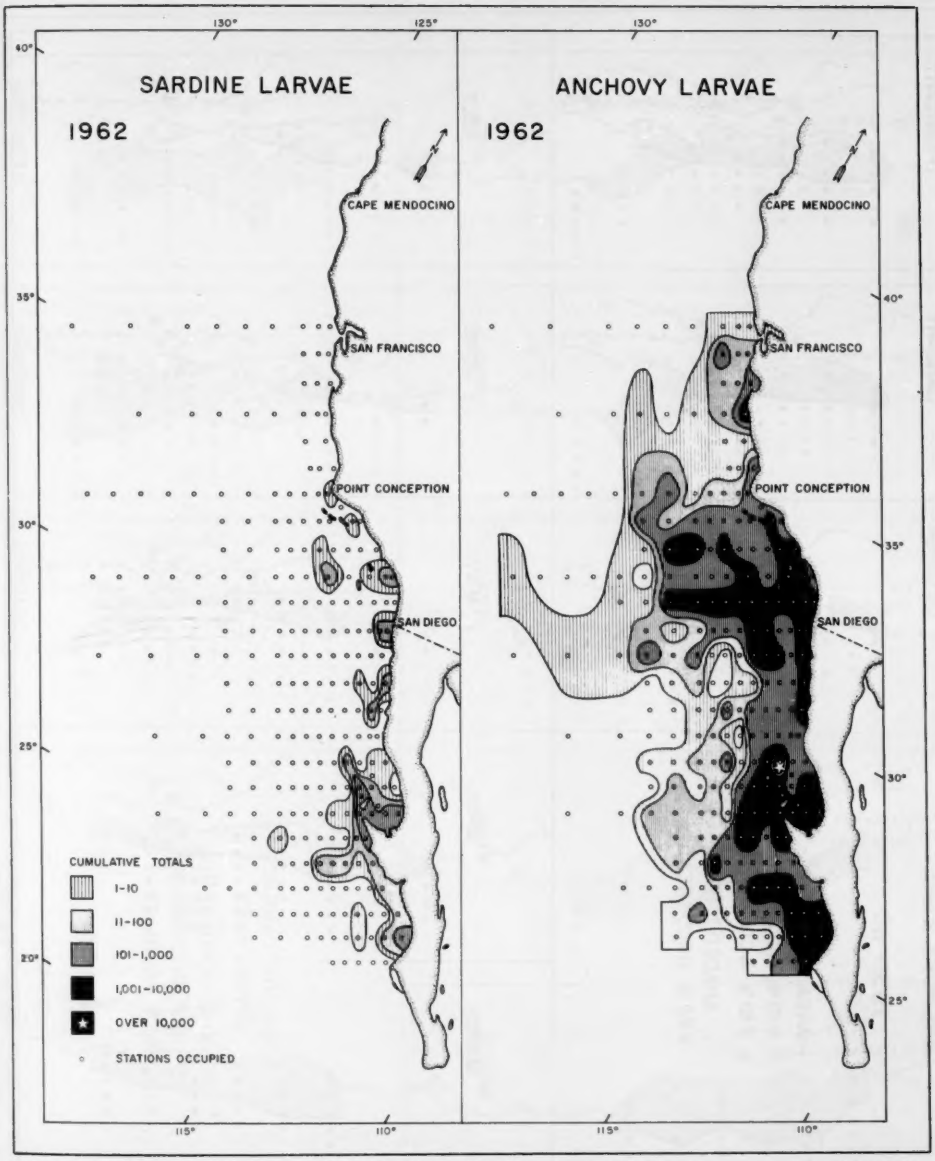


Fig. 2 - Distribution and relative abundance of sardine and anchovy larvae in 1962 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). (Fig. 3 of Ahlstrom, 1966.)

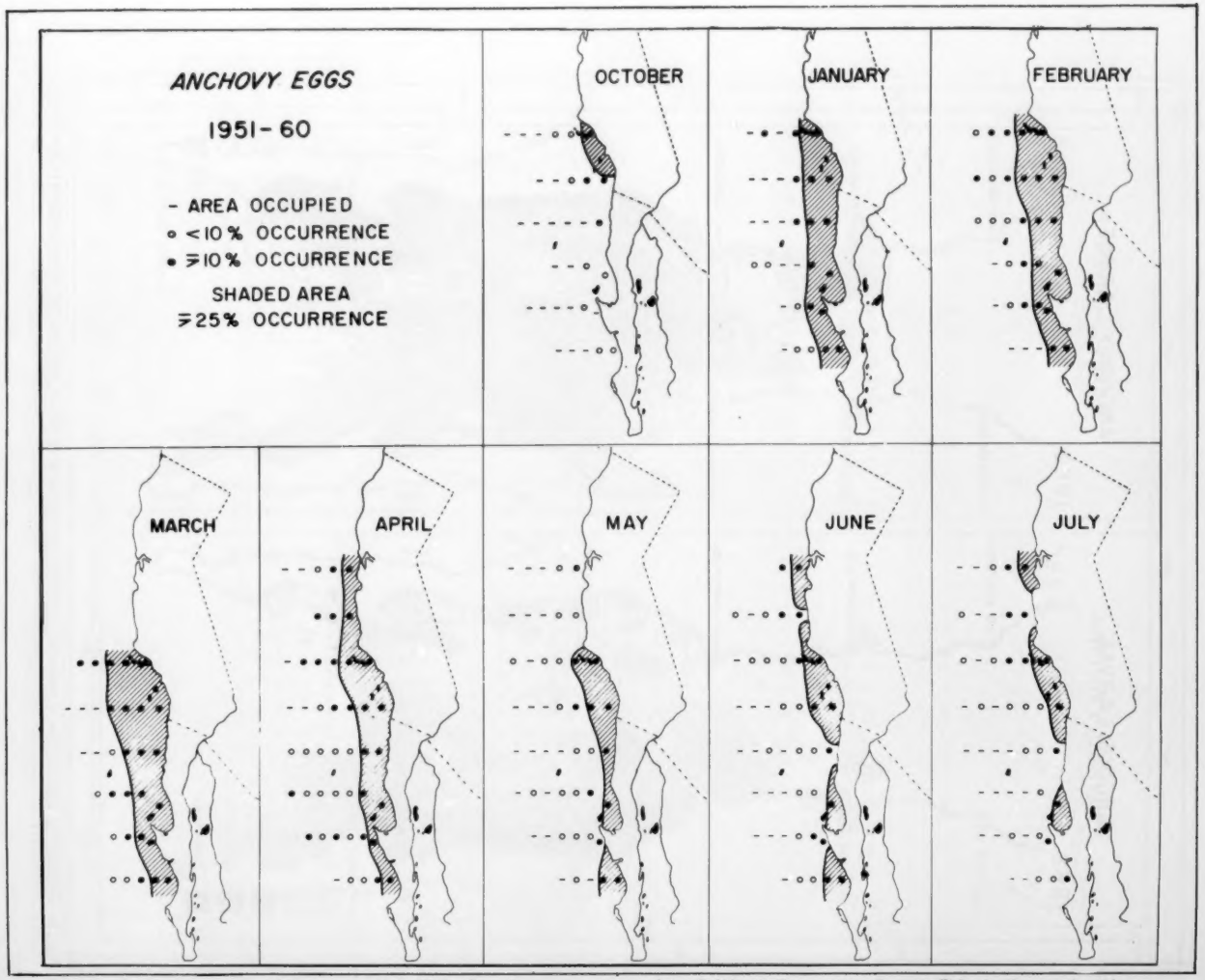


Fig. 3 - Percent occurrence of Anchovy eggs in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

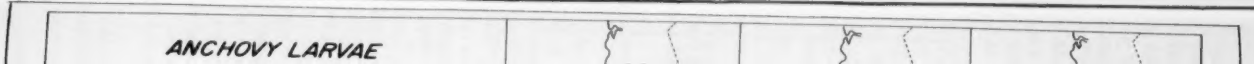


Fig. 3 - Percent occurrence of [illegible] (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

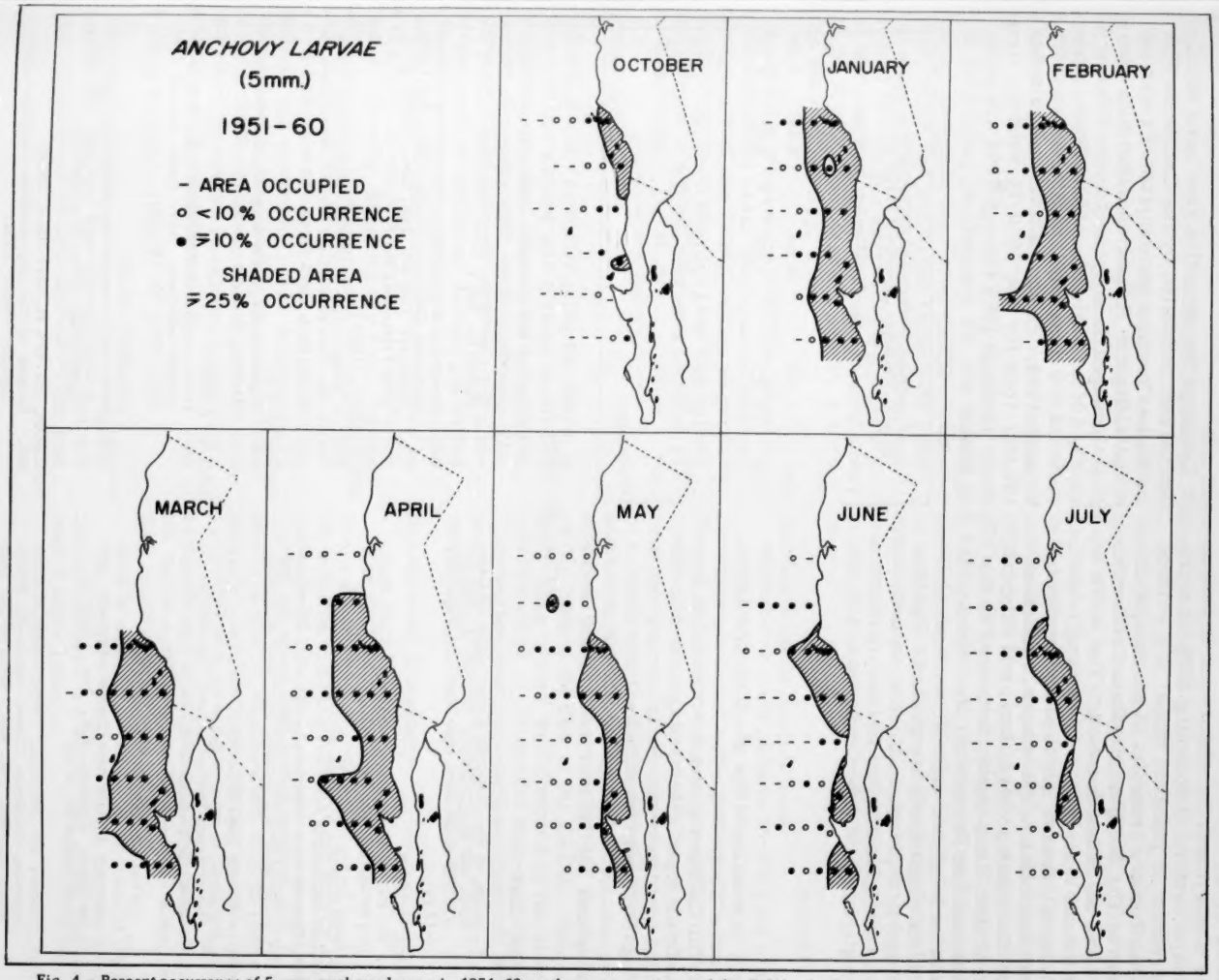


Fig. 4 - Percent occurrence of 5-mm anchovy larvae in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

The eggs and larvae show only slight differences in the extent of their distributions in the same month for which each is shown. The major centers of spawning (25% or more occurrences in plankton hauls) are evident first in January from Pt. Conception, California, to Pt. San Juanico, Baja California, and about 50 miles seaward. The north to south extents remain the same through April, with some increase seaward and northward to San Francisco. The southern extent remains the same in May, June, and July, but the northern limit varies between Pt. Conception and San Francisco. By October, the centers are located only off southern California and sometimes southward. The data for August, September, November, and December were insufficient for summarization to show the trends depicted in Figs. 3 and 4.

The Fishery

Until the 1965-66 season, when a reduction fishery was allowed by the California Fish and Game Commission for the northern anchovy in California, the resource had been virtually untapped. Major usage was in commercial landings restricted to canning and in landings for live and dead bait. Total use, including the new fishery for reduction, was summarized by Messersmith (1969) in his review of the industry through 1967, and by Hardwick (1969) for the fishery through 1968.

Landings for reduction have been strictly limited and controlled by the California Fish and Game Commission to quotas by zones and areas along the California coast with some slight changes from year to year (Messersmith, 1969; Hardwick, 1969). Quota totals were 75,000 tons for each season, 1965 through 1969. The quota total was raised to 100,000 tons for the 1970-71 season. Anchovy landings 1964 through 1969 are shown in Table.

Anchovy landings 1964 through 1969
(source - California Department of Fish and Game)

Year	Reduction	Other commercial	Live bait	Total
1964	0	2,488	5,191	7,679
1965	170	2,866	6,148	9,184
1966	27,335	3,705	6,691	37,731
1967	32,349	2,455	5,387	40,191
1968	13,795	1,743	7,176	22,714
1969*	65,099	2,533	5,538	73,170

*Preliminary.

LITERATURE CITED

AHLSTROM, ELBERT H.
1966. Distribution and abundance of sardine and anchovy larvae in the California Current region off California and Baja California, 1951-64: A summary. U.S. Fish Wildl. Serv. Spec. Sci. Rep. Fish. 534, 71 p.

HARDWICK, JAMES E.
1969. The 1967-68 anchovy reduction fishery. Calif. Dept. Fish & Game, Fish Bull. 147: 33-38.

HAUGEN, CHARLES W., JAMES D. MESSERSMITH and RUSSELL H. WICKWIRE
1969. Progress report on anchovy tagging off California and Baja California, March 1966 through May 1969. Calif. Dept. Fish & Game, Fish. Bull. 147: 75-86.

KRAMER, DAVID and ELBERT H. AHLSTROM
1968. Distributional atlas of fish larvae in the California Current region: northern anchovy, Engraulis mordax Girard, 1951 through 1965. Calif. Coop. Oceanic Fish. Invest. Atlas No. 9, vii + 269 p.

_____, and PAUL E. SMITH
1970a. Seasonal and geographic characteristics of fishery resources, California Current region--I. Jack mackerel. Commer. Fish. Rev., 32(5): 27-31. (Also Reprint No. 871.)

1970b. Seasonal and geographic characteristics of fishery resources, California Current region--II. Pacific saury. Commer. Fish. Rev., 32(6): 46-51. (Also Reprint No. 876.)

1970c. Seasonal and geographic characteristics of fishery resources, California Current region--III. Pacific hake. Commer. Fish. Rev., 32(7): 41-44. (Also Reprint No. 880.)

1970d. Seasonal and geographic characteristics of fishery resources, California Current region--IV. Pacific mackerel. Commer. Fish. Rev., 32(10): 47-49. (Also Reprint No. 891.)

MESSERSMITH, JAMES D.
1969. A review of the California anchovy fishery and results of the 1965-66 and 1966-67 reduction seasons. Calif. Dept. Fish & Game, Fish Bull. 147: 6-32.

SMITH, PAUL E.
MS. The increase in the spawning biomass of the northern anchovy, Engraulis mordax; 1951-1966.

SOUTAR, ANDREW
1967. The accumulation of fish debris in certain California coastal sediments. Calif. Coop. Oceanic Fish. Invest. Rep. 14: 136-139.

_____, and JOHN D. ISAACS
1969. History of fish populations inferred from fish scales in anaerobic sediments off California. Calif. Coop. Oceanic Fish. Invest. Rep. 13: 63-70.

VROOMAN, ANDREW M. and PAUL E. SMITH
MS. Biomass of the subpopulations of northern anchovy Engraulis mordax Girard.

KILLER WHALES PURSUE SEA LIONS IN BERING SEA DRAMA

Jim Branson
NMFS Fisheries Management Agent

On Jan. 23, 1971, during a patrol aboard the Coast Guard Cutter 'Storis' in the Bering Sea, I observed a pod of 7 killer whales (Grampus vectipinna) pursue a band of 20 to 25 Steller sea lions (Eumetopias jubata) around a Soviet SRTM trawler for over an hour.

At 3:15 p.m., on January 23, the Storis came up alongside the Soviet SRTM trawler 'Iskra', which had just begun to haul its gear from a depth of 440 fathoms. Its position was 54-18 N. 167-51 W., approximately 35 miles NW of Point Kadin on Unalaska Island, and 24 miles E of N from Bogoslof Island, a very large sea lion rookery.

At the time, there were 9 SRTMs operating in this immediate area. Each had an accompanying band of sea lions, waiting to garner what fish they could when the gear was pulled. Each group of sea lions averaged between 20 and 30 animals.

Drama Unfolds

As the Storis came alongside the Iskra, a group of killer whales was noticed about 600 yards from the ship. There were 7 whales: 4 adults, two subadults, and one apparently quite young juvenile; they were making a direct approach on the Iskra. As they got within a hundred yards or so, the sea lions showed obvious signs of panic, clustering together in a very tight group and staying alongside the trawler, literally brushing the hull. As the whales made a close approach, the sea lions would mass and dive under the SRTM, or swim around the bow or stern of the ship seeking safety on the other side. The whales would follow either by sounding or by going around the ends of the ship, at which time the sea lions would immediately retreat to the dubious safety of the opposite side.

A Lion's Probable Death

As long as the sea lions stayed tightly massed, the whales did not attack, but did make continuous close approaches on the sea lions. After about 20 minutes of this, the sea lions were momentarily caught at a disadvantage a few feet from the stern of the SRTM, and two of the whales leaped clear of the water in a dash on the sea lions. A small group of sea lions, 5 or 6, apparently panicked and split off from the main group; they got as much as 200 yards away from the ship. At this time I believe one sea lion was taken, although I could not be sure. The proximity of a whale to a single sea lion, and the latter's sudden disappearance, make it likely that this animal was actually attacked and probably killed. I was unable to see any blood on the water, however.

Another Kind of Surveillance

It was obvious at the end of an hour of this that the sea lions were getting quite tired. They had been moving very rapidly all this time. The whales continued to maintain a very close surveillance, approaching to within a few feet of the SRTM and the cutter. At one time, the two largest whales in the pod stationed themselves side by side facing directly toward the bow of the SRTM. Most of their back--from well forward of the blowhole to well aft of the dorsal fin--was awash. They maintained this position with a cold and beady eye on the sea lions, which were clustered tightly under the SRTM's bow.

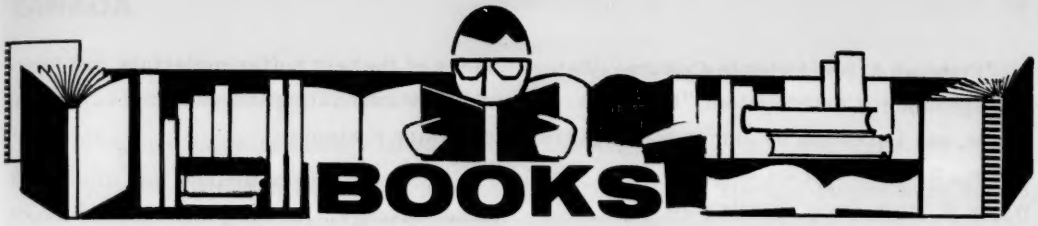
Denouement A Mystery

The SRTM required 40 minutes to get its doors aboard from the time it started hauling, 15 minutes to bring the cod end aboard, and another 10 minutes to reset and stream the net as it got underway. We left the area at this time and the whales were still in the immediate vicinity of the SRTM; the sea lions were doing their best to stay either on or alongside of the net which was streaming on the surface, or as close to the ship's hull as they could possibly get.

I'm sure the sea lions would happily have climbed aboard the ship if the sides had just been a little lower.

Fig. 1 - HOT PURSUIT: 4 killer whales round ship's bow in close pursuit of sea lions.

Fig. 2 - Pod of sea lions sheltering under bow of Soviet SRTM watch approach of 3 killer whales. (Photos: Jim Branson)



"Ocean Life" (In Color), by Norman B. Marshall, 290 illustrations, many drawn from living specimens by Olga Marshall, 214 p., $4.95. The Macmillan Co., Publishers, 866 Third Avenue, New York, N. Y. 10022.

A handbook of life in the oceans, handsomely illustrated in color. Dr. Marshall has designed it as a reference of current knowledge about the oceans beyond the tide marks.

He describes "the physical nature of the oceans and their fringes, and the history of exploration of the oceans' life forms." He outlines the "different environments and patterns of marine life, the life history of various groups and their ecological relationships."

The book contains a catalogue of various genera of life forms to match the 290 illustrations of particular species. There are underwater photos of corals. Mrs. Marshall painted some illustrations especially "to capture the transparent characteristics of jelly-like organisms."

"Sounds of Western North Atlantic Fishes (A Reference File of Biological Underwater Sounds)," by Marie Poland Fish and William H. Mowbray, 207 p., illus., $12.50. The Johns Hopkins Press, Baltimore, Md. 21218.

"In 1954 the Office of Naval Research requested the Narragansett Marine Laboratory to institute and maintain a reference file of biological underwater sounds which would be an up-to-date reference library of the recorded sounds of identified marine animals. To identify with precision and certainty sounds monitored in the field without seeing the organism that produced them is considered impossible by many investigators; such identification must be circumstantial, at best. However, certain information is useful in tentatively determining the source of sounds under such conditions; therefore, supplemental data are included here on distribution, ecology, and behavioral patterns of fish which may influence the occurrence of biological underwater sounds.

"Through our own research activity this library now contains characteristic sounds of numerous invertebrates, at least 24 marine mammals from both the Atlantic and Pacific oceans, and over 150 fish species recorded during experimental monitoring of some 300 species representative of coastal waters from Canada to Brazil. This report is limited to 220 species in 59 families of fishes studied by us along the Atlantic coast of the United States and in the Caribbean islands. Sound analyses, illustrated by 160 spectograms and 329 oscillograms, are presented for 153 species in 36 families. For each species, information is included on distribution, habits, size, sound production, and sonic mechanism."

"Fish and Invertebrate Culture--Water Management in Closed System," by Stephen H. Spotte, and Foreword by James W. Atz, 1970, 145 p., $8.95. Can be obtained from John Wiley & Sons, Inc., Publishers, 605 Third Avenue, New York, N. Y. 10016.

The book "shows how to culture freshwater and marine fishes and invertebrates in closed-system environments by controlling the chemical and physical factors in the water affecting their normal physiology.

"Part 1, Effects of Animals on Captive Water, treats biological, mechanical, and chemical filtration and the carbon dioxide system. Part II, Effects of Captive Water on Animals, deals with respiration, salts and elements, toxic metabolites, disease prevention by environment control, and laboratory tests.

"Fish and Invertebrate Culture offers the culturist both theoretical and practical information. For example, nitrification is discussed, along with its practical applications, such as how to construct and operate a biological filter. The chemical filtration techniques using activated carbon, ion exchange resins, air-stripping, ozone, and UV irradiation are also dealt with, both in theory and in practice. There are instructions for mixing large volumes of synthetic sea water, discussions of the best buffer materials, and formulas for calculating the carrying capacity of a culture system.

"Special features include line drawings of water management equipment and equipment functions, practical and up-to-date tables, and an extensive bibliography."

"Ferro-Cement Boat Construction," by Jack R. Whitener, 128 p., illus., $7.50. Cornell Maritime Press, Inc., Cambridge, Md. 21613.

"Here is a practical guide to every phase involved in construction of the hull, finishing and fitting out of ferro-cement boats. It also includes the following reports of vital interest to those contemplating construction:

"I: An Investigation of 'Ferro-Cement' Using Expanded Metal--by J. G. Byrne and W. Wright.

"II: Some Notes on the Characteristics of Ferro-Cement--by Lyal D. G. Cullen and R. W. Kirwan.

"The plan sections contain outline examples of four plans readily available in full scale . . . an 18' Auxilliary Cruiser, a 25' Cruiser, a 38' Sailing Ketch and a 54' Trawler."

VALUE OF 1970 LANDINGS IN MARITIME PROVINCES SETS RECORD

In 1970, the value of fishery landings in Canada's Maritime Provinces set a record, according to the Department of Fisheries and Forestry. The Maritimes are Nova Scotia, New Brunswick, and Prince Edward Island.

Preliminary data show that about 20,000 fishermen landed 1,129 million pounds of fish worth C$80 million. These compare with 1,232 million pounds valued at C$76.7 million in 1969, and 1,372 million pounds for C$73.8 million in 1968.

Strikes Play Big Role

The 1970 decrease in landings, compared to 1968 and 1969, was due mainly to a drop in herring landings. The subnormal groundfish landings were partially due to a fishermen's strike. No offshore fish were bought from late March until early fall by major processors in Canso, Mulgrave, and Petit de Grat because about 250 trawler fishermen were on strike.

Strikes by shore workers during 6 weeks in February and March at major fish plants in Louisbourg, Halifax, Lunenburg, and Lockeport also contributed to decline in groundfish landings.

Another factor was ICNAF closure of haddock fishery during March and April in two large areas (part of northeast Georges Bank, Browns Bank, and part of Emerald Bank).

Unfavorable December 1970 weather resulted in fewer lobsters landed in western Nova Scotia than during December 1969.

Record Volume & Value

There were record catches and values of redfish or ocean perch and shrimp landed. Record values too were set for hake, flatfish, and clams.

Fishermen harvested 106 million pounds of Irish Moss, worth C$2.9 million, a record.

The Most Valuable

In order of rank, lobsters (31.6%), scallops (16.1%), herring (9.6%), cod (9.6%), haddock (6.3%), and flatfish (5.6%) were 78.8% of total value.

Leading Species

The leading species landed were herring (579.2 million pounds, C$7.7 million), mostly in Nova Scotia (N.S.) and New Brunswick (N.B.); cod (142.6 million lbs., $7.7 million) mostly in N.S.; ocean perch or redfish (88.9 million lbs., $2.9 million) mostly in N.S. and N.B.; flatfish (88.4 million lbs., $4.5 million) mostly in N.S.; mackerel (32.2 million, $1.2 million) mostly in N.S.; lobsters (30.7 million, $25.3 million); and scallops (11.8 million, $12.9 million).

Landings by Provinces

By provinces, the landings were: N.S. 590.7 million pounds ($53.3 million), N.B. 438.4 million ($17.2 million), and P.E.I. 100.4 million ($9.6 million).

* * *

MARINE SPORTS-FISHING LICENSES TO SUBSIDIZE HATCHERIES

Nonresident sports fishermen in Canadian tidal waters will pay a license fee based on vessel size. All proceeds will go to build coho and spring-salmon hatcheries.

The license fee for privately owned vessels will range from C$15 to $75, depending on length. Charter and rental boats servicing nonresident sports fishermen will be classed commercial. These fishermen will pay the same license fees as fishermen in salmon fleet, $100-$400.

Exceptions

Only charter or rental Canadian boats under 30 feet will not pay license fee. This will exempt most marinas renting small boats on a daily or hourly basis.

The new fees structure will go into effect in 1972. A $400,000 return is expected during first year. Licenses will be available from any office of Department of Fisheries, and mail applications will be accepted. ('Fisheries News', Dept. of Fisheries of Canada, Jan. 29.)

EUROPE

NORTH SEA MACKEREL FISHERY OVEREXPLOITED

Until the mid-1960s, the mackerel stock in the northern North Sea and the Skagerrak was underfished. The annual catch of Danish, Norwegian, and Swedish fleets during the 1950s fluctuated between 10,000 and 20,000 metric tons.

In 1964, many new large purse-seine vessels with power blocks were introduced. The Norwegian catch doubled. It multiplied each year until it peaked at 868,000 tons in 1967. Thereafter, catches declined each year to 683,000 tons in 1969. The indications of excessive fishing were clear, and severe restrictions were imposed in 1970; the catch reached only 293,000 tons.

Fewer Fish

Now, scientists believe the stock has been overfished. Based on tagging research by Norwegian biologists, estimates of mackerel in the area showed fewer fish than would be caught in a good season. Like other species, the size of the year-classes entering the fisheries has fluctuated yearly and recruitment has not been good.

Outlook Poor

The present outlook for North Sea and Skagerrak mackerel fishery is poor, but biologists hope that the good 1969 year-class will remain plentiful until its productive age. They expect Norwegian catch regulations to be helpful.

If stock size can reach about one million tons, the annual catch might reach 400,000 tons. The stock can be utilized better in a controlled fishery. But with fishery at its maximum sustainable yield, there will be fewer larger fish. ('Fiskeribladet')

ITALY

IMPORTS 45,000 TONS OF FROZEN TUNA DESPITE HIGH PRICE

Of all Japanese products imported into Italy, frozen marine products, mostly tuna, account for about 20% of value. In 1970, Italian demand was greater than supply, and frozen tuna brought record prices. These high prices were expected to continue.

High Prices In 1970

In December 1970, the price of tuna (cost, insurance, freight Italy) reached US$610-640 a metric ton for round yellowfin; $880-930 for semidressed yellowfin; $940-990 for dressed yellowfin; $880-930 for semidressed big-eyed; and $640-700 for dressed big-eyed.

Despite such high prices, total Italian imports of frozen tuna in 1970 were about 45,000 metric tons, down from 48,835 in 1969.

Italy's 45,000 MT Quota

Italy allocates an annual quota of about 45,000 metric tons of frozen tuna free of import duty. The imports are processed by Italian canneries into canned-tuna-in-olive-oil, almost all consumed domestically.

In 1970, Italy imported frozen tuna from Japan, S. Korea, Taiwan, U.S., Cuba, France, and South Africa.

No Sharp Price Decline

Price this year will not decline sharply so long as Italy imports a reasonable quantity to keep the monthly capacity of her canneries (about 4,000 metric tons) balanced. However, the current price of nearly $1,000 is considered too high. About $800 for dressed yellowfin will be break-even point for canneries. ('Suisancho Nippo', Jan. 11.)

ICELAND

TRAWLER FLEET EXPANDS

The failure of the herring fishery in recent years has renewed Icelandic interest in trawling. Greater effort increased landings of cod, haddock, and other groundfish. Favorable resource conditions, strengthened markets for frozen fish, and better export prices also influenced the catch.

In 1969, the groundfish catch was the largest since 1960. According to the Fisheries Directorate, the 1970 catch will show further large gains, with cod alone up 24,000 metric tons.

Groundfish Fleet Encouraged

Good fishing by the groundfish fleet in 1969 strengthened vessel owner-operators sufficiently to encourage them to better equip their fleet.

Good catches continued in 1970. The favorable 1964-66 year-classes now promise good catches in 1971 and 1972.

The principal fishing grounds have been in Icelandic coastal waters, mainly along the south and west coasts.

Cod Emphasized

Emphasis on cod is being encouraged for the smaller (up to 200 tons) and the larger trawlers. The government has approved bids for 8 new 1,000-GRT stern trawlers; also five 500-GRT stern trawlers will begin fishing soon.

Year of Stern Trawler

Last year was the year of the stern trawler. At the beginning of 1970, Iceland owned 1 small stern trawler; by year's end, 5 others were built and fishing; and another was being built. Also, eight 1,000-GRT stern trawlers were under construction for government and private interests: 2 in Poland, 4 in Spain, 2 in Iceland.

Of the 500-ton trawlers, one 550-ton vessel purchased in W. Germany is fishing and another is being built.

The purchase of three 3-year-old French trawlers has been agreed on. (Reg. Fish. Attaché, Copenhagen, Jan. 26.)

DENMARK

80% OF ANNUAL 1,000-MT AGAR PRODUCED FROM LOCAL SEAWEED

Denmark produces about 1,100 metric tons of agar annually: about 80% from locally harvested seaweed, the balance from imported gelidium. In 1969, production totaled 1,162 tons; about 90%, worth US$1.7 million, was exported.

The raw material is called "Gaffeltare" (Furcellaria Fastigiata); the extract is "furcellan". Furcellan is sold in powder form and is known as Danish agar.

A Barber's Brain Wave

Production began in 1943, when a barber trying to make a permanent-wave lotion from seaweed found the algae contained a mucilaginous substance that became gelatinelike on cooling. It was used during 1944/45 as a bacteriological gel, when Japanese agar supply was cut off. Most of present product is used to stabilize foods.

Agar From Seaweed

Four Danish firms have produced agar from seaweed. Five or six vessels work continuously using a special trawl that collects the weed. Production of seaweed, from offshore waters 4 to 15 meters deep, is around 25,000 metric tons a year. The agar content varies from 2%-5% of raw-material weight.

The largest amounts have been taken in Kattegat north of Djursland, where concentrations of loose and drifted weed seem to gather. Large harvests in 1961-65 reduced the resource seriously. The industry was in critical shape in 1966 and 1967 until new resources were located that could be taken by trawl. Imports started in 1964.

Exports Exceed Local Use

Since 1949, exports of agar have far surpassed domestic use. In 1969, the principal markets were W. Germany, France, Great Britain, Italy, Spain, Switzerland, Mexico, Argentina, and the Netherlands. Small quantities go to many other countries. (Reg. Fish. Att., Copenhagen, Jan. 19.)

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DENMARK'S SHRIMP FISHERIES

Denmark's shrimp catch comes from 2 main sources: North Sea area and West Greenland. In 1969, the catch of deep-water shrimp (Pandalus borealis) from North Sea and Skagerrak was 5,434 metric tons. In Greenland waters, the catch totaled 5,982 tons. Also, about 347 tons of common shrimp (Paelamen fabricii) were caught mainly in Belt Sea and Baltic area.

Fishery Began In 1931

The Danish shrimp fishery started in 1931. The catch rose steadily, peaked at 6,204 tons in 1968, and now seems to have leveled off. At first, main source was the Skagerrak and, later, mainly the North Sea. In 1960, fishing began on Fladen Ground, between Scotland and Norway; now the bulk of catch comes from there.

Greenland Shrimp Fishery

The Greenland shrimp fishery started on a small scale for canning in 1935. It was dormant during World War II. In 1947, it resumed and, during 1949, good resources were found in Disko Bay area. Since then, output has risen steadily. Now, it equals and frequently exceeds Denmark's level.

Because overfishing threatens Greenland less, the potential there appears much better than in Denmark. Fishing can be carried out only in limited areas, where bottom conditions are favorable. So any temporary overfishing soon is compensated by entry of shrimp from outside areas. Catch rates are greater in Greenland: for the most part, over 50 kilograms per hour and, in some cases, 100 kilograms or more. In Denmark, average catches run under 50 kilograms an hour.

Scandinavian Market

In Denmark and other Scandinavian countries, shrimp are sold fresh-cooked and peeled, in light brine, for use in open-faced sandwiches or in salads. Quick-frozen shrimp packed in bags are increasing in importance. The shrimp are tender and mild in flavor. In Denmark, shrimp are cooked aboard vessel to preserve quality. In Greenland, most of catch Is processed in shore plants, where a large part is canned for export.

Top export markets for frozen shrimp are Sweden, Germany, the United Kingdom, and Switzerland. Canned-shrimp markets are Germany, United Kingdom, Sweden, Switzerland, France, and U.S. (Reg. Fish. Att., Copenhagen, Jan. 21.)

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OYSTERS REMOVED FROM RESTRICTED IMPORTS LIST

Effective Jan. 1971, oysters with or without shell, fresh, chilled, or frozen, can be imported into Denmark duty free. Until then, oysters were the only fishery product retained on Denmark's list of restricted imports.

Oysters are a festive food. The supply is small, the cost high. Limfjord oysters are in season usually from mid-Sept. until Christmas. In the past, when Limfjord oyster were not in season, limited quantities came from Holland.

Prices for smaller-size oysters, from 40-60 grams each, were about US$0.30 each. Larger oysters were $0.38-0.43 each.

Spring 1970 Planting

During spring 1970, 1.5 million new oysters were planted in Limfjord at cost of US$133,000. The harvest in the next few years will be about 200,000 oysters. Some die from winter temperatures, during transport, and for other reasons. (Reg. Fish. Att., Copenhagen, Jan. 29.)

UNITED KINGDOM

GOVERNMENT PAYS DAMAGES FOR POLLUTING RIVER

The following is a dispatch from The Times, London, which appeared in The New York Times, March 21, 1971:

A payment of £5,000 ($12,000) with costs has been made by the Ministry of Defense as compensation for damage suffered by the Freshwater Biological Association at one of its research stations. The settlement was reached out of court after more than five years of litigation.

The damage was caused by paint dumped in the Frome River in Dorset from the military camp at Bovington. This took place a year after the association established a network of experimental channels to study the behavior of salmon, trout and coarse fish as part of an ecological study of the river.

Camp Indicted

The main laboratory of the Freshwater Biological Association is on Windermere, where aquatic life in relatively calm waters is studied. The outstation in the Avon and Dorset River Authority area was an investigation into the environmental influences in fast-flowing hard water.

The contamination of the Frome has become one of the best-documented cases of the destruction caused by the dumping of pollutants into a river. The Bovington camp was indicted after a careful study involving the association's scientists and the fisheries department of the river authority.

During the investigation, innocuous salts were released into the river and their pattern of distribution plotted along the stream. Introduction of the substances from the Government establishment showed a spread identical to that of the poisonous pollutant.

Association Had to Sue

Usually a river authority can prosecute for this type of offense; but as a Government department was involved, it was left to the association to sue for damages to the value of the scientific information lost and of the disturbance caused to research.

It will probably take 14 years before it is possible to say whether the Frome has recovered completely or has fundamentally changed in character. Fourteen years was the age of the oldest fish taken from the river.

H.C. Gilson, director of the Freshwater Biological Association, expressed belief that the settlement established an important principle in making the Government pay for damage and disruption to amenities.

NORWAY'S 1970 FISHERIES WERE PROFITABLE

Norway's 1970 fishing season was the second best ever in quantity and value. The results were unexpected because forecasts had not been optimistic, and because important pelagic species were overfished and depleted. The forecasts also indicated reduced landings of cod and haddock, but this happened only with haddock.

The following listing for 1966-70 includes data for the best 3 years:

	Quantity Metric Tons	Exvessel Value US$1,000,000
1970	2,665,092	182.7
1969	2,206,452	144.9
1968	2,592,571	144.8
1967	3,036,866	166.5
1966	2,655,747	187.5

Rising prices, due to a lively export demand, produced the high gross value. The increase in quantity resulted mostly from abundant capelin landings--a record 1,307,281 metric tons, 49% of total. These were worth US$31.3 million, almost twice the 678,935 tons landed in 1969. One new contributing factor was the 90,000 tons of fish taken (herring and mackerellike species) by purse seiners off west Africa and delivered to factoryships.

Pelagic Landings

Landings in Norway of pelagic species (herring, sprat, capelin, mackerel, Norway pout, sand eel, and polar cod) were 1,992,226 tons; the figure was 1,664,881 tons in 1969. The herring fisheries based on Atlantic-Scandinavian stocks and resources produced only a fraction of landings during years when this resource was still intact.

Until 1969, mackerel was the fish landed in greatest quantity in Norway. The record year was 1967 with 868,000 tons. In 1969, 683,000 tons were landed, but only 292,708 tons were produced in 1970. Mackerel is overfished. Therefore, Norway imposed strict regulations for 1970 and will apply even stricter ones in 1971. About 400,000 tons of mackerel appear permissible annual catch from North Sea--assuming resource level is normal.

Capelin Fishery

Due mostly to capelin fishery, the fish meal and oil industry landed 1,892,000 tons from pelagic resources in 1970. This compared with 1,564,000 in 1969 and 1,947,000 tons in 1968.

The prospects of edible herring processing industry are curtailed indefinitely because raw material is lacking. In an agreement with Denmark, USSR, and Iceland, Norway has consented to limit her 1971 catch of adult Atlantic-Scandinavian herring to 1969 level of 15,000 tons, and the catch of juveniles to 70% of the same level, or 25,000 tons.

Cod Set Record

Cod landings, though down in second-half 1970, set record: 303,855 tons. These surpassed 1969 catch by 30,389 tons. The landings were 101,329 tons of spawning cod, 49,054 tons of Finnmark spring cod, and 153,472 tons "other cod."

The 1970 landings of "other cod" were also a record. These surpassed 1969's by 17,944 tons, and outweighed for first time the aggregate spawning-cod and spring-cod catch. Total landings of codlike species other than cod for human food was 176,664 tons; they were up 7,372 tons from 1969.

Other Consumer Species

The yield of other consumer species, including flatfishes, sharks, skate, ocean perch, catfish, and eel were 40,691 tons; in 1969, 45,460 tons. Landings of some of these species fell in recent years.

The reduced landings of dogfish and Greenland halibut resulted from difficulty of medium longline vessels in getting crews. There was a considerable reduction in cod catch per unit of effort in North Atlantic waters. This trend may improve gradually in 1974 or 1975, when some abundant year-classes probably will appear and influence the fishing.

Export Demand & Price Higher

Export demand and prices of fish products increased during 1970. Norwegian fishery exports probably will reach records when final figures are in. An export value of about US$280 was expected; it was US$250 million in 1969. ('Norwegian Fishing and Maritime News')

LATIN AMERICA

PERU

REPORT ON FISH MEAL PRODUCTION, EXPORTS, AND STOCKS

Peru is the world's leading producer and exporter of fish meal. The product is the largest competitor of U.S. exports of soybeans and meal.

Peru has been building stocks. On Jan. 1, 1970, these were estimated at about 725,000 short tons.

These stocks were the largest since March 31, 1968, and were expected to increase in Jan.-Mar. 1971 quarter if traditional trend prevailed.

Improved Catches

The increase reflected improved catches, which boosted estimated Oct.-Dec. 1970 fish-meal output to 725,000 short tons. This figure was 174,000 over 1969 period and largest since 1967 period.

Forecast

If Peru's 1970/71 catch continues unbroken 5-year increase, production should at least approximate preceding year's record. This could occur even with a possible decline in meal extraction.

Production could amount to 2.34 million tons, compared to 2.32 in 1969/70, if the following occurred: the estimated catch of 12 million short tons (11.7 million tons in 1969/70) and meal-extraction rate of 19.5% (19.8% in 1969/70).

This volume, plus 360,000 short tons carryover stocks on Sept. 30, 1970, would total 2.7 million tons; of total, only 40,000 would be used in Peru.

Fish Meal Exports by Quarters

Year beginning Oct. 1	Net exportable supply	Exports	Ending stocks	Exports share of exportable supply
	1,000 short tons			%
1970/71	2,660	-	-	-
1969/70	2,393	2,033	360	85.0
1968/69	2,285	2,175	110	95.2
1967/68	2,561	2,111	450	82.4

Total exportable supplies of Peruvian fish meal in 1970/71 would approximate 2,660,000 tons, a rise of nearly 270,000 tons from 1969/70 level. The increase is expected to lead to larger exports in 1970/71, unless Peru decrees further substantial increases in stocks or production costs.

MEXICO

NAVY INTENSIFIES PATROL OF NATIONAL WATERS

On Feb. 19, Admiral Bravo Carrera, Mexico's Secretary of the Navy, ordered round-the-clock surveillance of Mexico's national waters in Gulf of Mexico, Caribbean Sea, and Pacific Ocean to prevent foreign-flag vessel from entering territorial seas illegally. Special efforts to achieve this will be made in fishery zones with large schools of fish and shellfish. (Reg. Fish. Att., U.S. Emb., Mexico, Feb. 24.)

CARIBBEAN

BAHAMA ISLANDS

BAHAMAS COMMISSION 4 NEW PATROL VESSELS

With considerable fanfare, the Bahamian Government commissioned on March 5 four new patrol vessels: 'Acklins', 'Eleuretha', 'Andros', and 'San Salvador'. The vessels are manned by 45 men of the new Police Marine Division and are armed with NATO light-machine guns.

The vessels will patrol Bahamian waters (3-mile territorial sea, 3-12 mile fisheries zone) for fishing violators. They are expected to be on the lookout for spiny lobster fishermen during the lobster closed season March 16-August 31.

In dawn light off Palawan Island, mackerel are lifted by scoop-net from purse seine over side of boat to deck. They will be showered with crushed ice and shoveled into tube.

The deep tropical waters off the 7,000 Philippine Islands are rich in fish. FAO experts have helped develop purse seining.
(FAO/S. Bunnag)

JAPAN

1970 EXPORTS OF FROZEN FISHERY PRODUCTS ROSE 10.6%

In 1970, the Japanese exported 179,000 metric tons of frozen fishery products, about 10.6% above 1969. Because of higher prices, the value of these exports increased 18.7%. The Japanese earned US$95 million in foreign currencies, $15 million more than in 1969.

Significant Changes

Most significant changes occurred in exports of tuna, swordfish, mackerel, saury, and squid. Frozen-tuna exports totaled 62,514 tons, about 3,000 tons (4%) below 1969; compared with 40% decline from 1968 to 1969, the decrease in 1970 was small.

The low rate of decline in 1970 was due to sharp increase in skipjack sales. These almost tripled 1969's and made up most losses in albacore and yellowfin shipments.

Saury & Pacific Mackerel

During 1970, saury catches were poor. Exports of frozen saury totaled 14,337 metric tons, down nearly 2,000 tons from 1969. However, value rose over US$2.1 million due to higher prices. These averaged US$667 a metric ton (US$605 a short ton), or about US$207 a ton higher than in 1969.

Pacific mackerel exports of 11,386 tons were more than double the 1969 figure. Much was exported to overseas tuna bases for use as tuna bait.

Over half the 22,361 tons of frozen squid went to Italy. ('Suisan Tsushin', Feb. 27.)

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FROZEN-TUNA IMPORTS ROSE SLIGHTLY IN 1970

In 1970, imports of tuna (mostly frozen) into Japan were about 35,000 metric tons, slightly above 1969 imports, according to Ministry of Finance. Compared with sharp gains in earlier years, this indicates that tuna imports are leveling off. Due to higher prices, the value of imports was up 27% from 1969. ('Suisan Tsushin', Feb. 24.)

Frozen Tuna & Billfish Imports

	Quantity Metric Ton	Value US$	Average Price US$/Metric Ton	Major Suppliers Okinawa	South Korea	Taiwan
				Metric Tons		
Tuna:						
Albacore	3,232	1,863,250	577	781	316	1,760
Yellowfin	7,180	4,448,500	619	3,359	1,595	1,657
Bluefish	342	206,270	605	29	49	104
Skipjack	5,329	1,488,170	279	683	75	2
Others[1]	19,110	9,484,130	496	4,951	4,730	7,309
Total 1970	35,193	17,490,320	Not available	9,803	6,765	10,832
Total 1969	34,970	13,782,050	Not available	8,803	7,773	11,898
Billfishes 1970	16,235	7,705,360	Not available	3,132	4,106	6,215

1/Mostly big-eyed tuna.

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1971 CRAB FISHERY TO BEGIN IN BRISTOL BAY

Two Japanese crab fleets were scheduled to begin fishing in Bristol Bay in mid-March. The 'Keiko Maru' fleet (Nippon Suisan, Hoko-ku Suisan, and Hokuyo Suisan) consists of 14 trawlers and 2 "kawasaki" (deck-loaded, tangle-net, picking boats).

The fleet's quota is 19,200 cases (48 8-oz. cans) of king crab, and 7,460,000 tanner crabs.

JAPAN (Contd.):

The fleet has reduced its crab canning lines to 1 (from 2 in 1970). It will operate its 3 vacuum-packing machines at full capacity to increase output of frozen crab.

'Koyo Maru' Fleet

The 'Koyo Maru' fleet (Taiyo, Nichiro, and Kyokuyo) has 18 trawlers (19 in 1970) and no "kawasaki" boats (in 1970 it had 3). It will test 150-200 crab pots to replace tangle nets in the future.

The fleet's canning lines will be phased out and replaced by 3 vacuum-packing machines (only 2 in 1970). Its 1971 production quota is 18,300 cases of king crab, and 7,140,000 tanner crabs.

Tangle Nets to Pots

Although the number of Japanese crab motherships this year is the same as in the past, there is a sizable increase in trawlers, and a decrease in "kawasakis". This reveals a shift from tangle nets to pots.

Japan's crab quota for 1971 in the eastern Bering Sea is 37,500 cases of king crab (85,000 cases in 1970); tanner crab, 14.6 million (21 million in 1970). ('Suisan Keizai', Feb. 2.)

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READIES JOINT FISHING VENTURE IN NEW ZEALAND

Hokuyo Suisan, C. Itoh, and New Zealand firm Wonder Foods will establish a joint fishing and processing venture in Nelson, South Island (New Zealand) around June 1971. The company will harvest the abundant and unutilized Spanish mackerel (Scomeromorus pineusis). It will process the catch into "surimi" (minced fish meat) at a shore plant with a daily processing capacity of 3-4 tons.

Authorized capital is US$100,000: the Japanese and New Zealanders 50-50. ('Suisan Tsushin', March 3.)

NMFS Comment: The Japanese established another joint venture in New Zealand: Taimoana Fisheries Ltd., in Nov. 1967. Taiyo Fisheries Co. joined A. G. Wicclams and 16 other New Zealand investors. Taiyo's share was US$100,800 (36.3 million yen), 27.4% of total capital. Taimoana concentrates on trawling.

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MIDWATER TRAWLING FOR ALASKA POLLOCK IN BERING SEA CONSIDERED

Until 1969, Japanese "independent" trawlers fished Alaska pollock most of the year north of Unimak Island (Alaska). The peak season was July-mid-October. Frequent winter storms and spawning season between April and June caused low catches.

However, a comparison of 1970 catch with 1969's shows a decline: the same level for July; 30% less for August; and 50% less for Sept. 1970.

What's Needed To Break Even

Large trawlers cannot break even unless 23-25 metric tons of surimi (minced meat) is produced each day. To achieve this, at least 100-110 tons must be caught.

Since Sept. 1, 1970, the catch has declined from 70-80 tons/day per trawler to 30-50. On Sept. 13, 1970, only about a month before season's end, the independents moved to northwest of Pribilof Islands. The catch again increased to 100 tons per day/trawler.

Rocky Grounds

Rocky grounds pose new problems: Trawls are frequently damaged northwest of Pribilof Islands by rocky bottom (unknown on Unimak grounds), yet larger catch makes it profitable to fish there.

Alaska pollock is distributed along Aleutians and in the Gulf of Alaska, but daily catch is only 30-40 tons per trawler. Both independent trawlers and trawl fleets fish only during day. To make pollock fishing more efficient, it will be necessary to learn how to fish at night with midwater trawls. ('Minato Shimbun')

NMFS Comment: Although 1970 Alaska pollock catch in Unimak area reportedly declined from 1969, total Japanese Bering Sea pollock catch increased from 678,000 metric tons in 1969 to 1,031,000 metric tons in 1970.

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JAPAN (Contd.):

EXPORT PRICE OF BALEEN WHALE OIL TO INCREASE 30% IN DEC. '71

The Japan Whale Oil Joint Sales Co. has informed European merchants that export price of baleen whale oil produced during 25th Antarctic whaling season (beginning Dec. 12, 1971) will be increased 30% over 24th-season prices. It will be US$275 (99,000 yen) per metric ton--highest in 10 years.

The Sales Co. was established by 6 companies including Taiyo Gyogyo, Nippon Suisan, and Kyokuyo Hogei.

World Prices Increasing

The international price of baleen whale oil has been increasing because of worldwide shortage of edible oil. Another increase will strengthen Japanese whaling industry which, the Japanese say, has been stifled by international restrictions.

Baleen Whale Oil

Baleen whale oil is processed from Antarctic fin and sei whales. It differs from sperm whale oil. About 70% of Japan's baleen whale oil is exported to Europe as raw material for oils and fats, including margarine for human consumption.

Rising Prices Encourage Industry

After a 3-year interruption, the whaling companies will resume commercial production of sperm-whale oil during 25th Antarctic season. This oil is used for lubrication oils and detergents. Demand for it also has increased. Its export price is expected to exceed present $262/metric ton for North Pacific sperm-whale oil and exceed $300. ('Nihon Keizai Shimbun')

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EELS SPAWN ARTIFICIALLY

The Naiwan Fisheries Experimental Station has successfully induced the artificial spawning of eels (Anguilla japonica) after other research groups had failed.

About 5,000,000 Eggs

Five 7-, or 8-year-old females, 75-85 cm. long, and weighing 1,000-1,200 grams were used in the experiment. Since Sept. 25, 1970, they had been injected with three hormones and the pituitary extract of one rainbow trout. Three eels died one month after the injections began; of the remaining two females, one spawned about five million eggs, the other was about to spawn in Jan. 1971. ('Minato Shimbun', Jan. 10.)

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SHRIMP FARMING VENTURE

The MBC Development Co., a subsidiary of Minami Nippon Broadcasting Co., is starting to farm shrimp. It has constructed two large tanks holding 2,000 metric tons of water and six 100-ton tanks close to northern edge of Kagoshima Bay.

The small tanks will be used to hatch eggs and grow young shrimp. After one month, the young shrimp will be transferred to the large tanks, each having capacity of 120,000-130,000 shrimp. Each large tank is expected to yield about 80,000 shrimp every 6 months.

The Plan

The shrimp will be fed proteins made from petrochemicals, fortified with vitamins, and impregnated with a special odor. When harvested, each shrimp is expected to be 15 centimeters (almost 6 inches) long and weigh about 20 grams (0.7 ounce). To stimulate growth, sea water pumped from the bay will be heated. If feasible, heat from hot springs will be used. Otherwise, oil may be used to raise temperature of sea water.

First Harvest Nov. 1971

MBC does not expect to know until Nov. 1971 whether the venture will succeed. The first harvest is scheduled then to be marketed at average price of 4,000 yen per kilogram (US$5.05 per lb.). Production cost per kilogram is estimated to range between 2,300 and 2,500 yen (US$2.90/lb.-$3.15/lb.).

At present, control over shrimp egg-laying activity has not been perfected. Initially, at least, egg-laden shrimp will have to be obtained. For the future, the firm plans to have the shrimp lay eggs twice a year, in April and in August.

A student of Dr. Motosakii Fujinaga, a shrimp-culture expert, is technical adviser. Also assisting is the Fishery Experimental Station of Kagoshima Prefecture. (U.S. Consulate, Tukuoka, Feb. 23.)

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JAPAN (Contd.):

JAPAN'S PACIFIC SALMON CATCHES EXCEED QUOTAS, SOVIET LAGS

In 1970, in waters off Soviet Far East Coast, Japan caught 90,854 metric tons of Pacific salmon; the Soviet Union caught only 39,053 tons in her Far East rivers. This was reported by Japanese Fisheries Agency.

Japan's catch exceeded the 90,000-ton quota agreed on during Japan-Soviet Fisheries Commission negotiations in April 1970; the USSR catch fell below 40,000-ton quota. ('Yomiuri', Mar. 5, 1971.)

NMFS Comment: Table (below) shows that, except in 1968, Japanese Pacific salmon catches exceeded the quotas set at the yearly Fisheries Commission meetings. However, USSR Pacific catches fell substantially below quotas. At the 15th Annual Japan-USSR Fisheries Commission meetings in Tokyo, which began in early March 1971, the problem of the declining Pacific salmon resource was a subject of major discussion. The Soviets stressed conservation of the resource; the Japanese wanted a higher quota in 1971.

Salmon Catch in Area Regulated by Japanese-Soviet Fisheries Commission, 1966-70

	Japan		USSR	
	Catch	Quota	Catch	Quota
	Metric Tons			
1966[1/]	100,782	96,000	56,223	65,000
1967[1/]	144,873	108,000	78,000	83,000
1968[2/]	92,012	93,000	36,191[4/]	60,000
1969[1/]	109,757	105,000	75,469	80,000
1970[3/]	90,854	90,000	39,053	40,000

1/'Suisan Tsushin', Apr. 2, 1969.
2/ Japanese press.
3/'Yomiuri', Mar. 5, 1971.
4/40,177 ('Suisan Tsushin')

SOUTH KOREA

S. KOREANS INTERESTED IN N. PACIFIC ALASKA POLLOCK

South Korean fishermen have concentrated on high-seas tuna fishery in line with government's policy to increase earnings of foreign currencies. Now they appear to be focusing on trawl fishery in "northern waters" (Okhotsk Sea, Bering Sea, and North Pacific Ocean). They are especially interested in Alaska pollock, now in greater demand on market than salmon.

Less Money In Tuna

The reason is that Koreans, like Japanese, are making less money in tuna fishery because of declining resource, recruitment difficulties, and mercury-in-tuna problem.

Japanese fishermen have reported 5-6 Korean trawlers fishing for pollock north of Kuriles.

Trawlers for Northern Waters

Also, Japanese data show that in fiscal year 1970 (ends March 1971), about 10 small, used trawlers were sold to S. Korea for use in "northern waters." The Japanese Fisheries Agency foresees a rise in these exports. Korea already has around 20 multipurpose vessels that could be deployed in North Pacific for bottom and midwater trawling.

Japanese Uneasy

Pollock fishing by S. Korea and Soviet fleets are causing uneasiness among Japanese fishermen. They are talking about voluntarily regulating pollock fishing during summer in view of poor condition of the resource.

The Japanese also feel that the Soviets, who claim Japanese are overfishing egg-bearing pollock, will raise subject at annual meeting of Japan-USSR Fisheries Commission. ('Suisan Keizai Shimbun', Mar. 5.)

TAIWAN'S TUNA FISHERY

Taiwanese fishing firms have been hurt by declining tuna catches in the Indian and Atlantic oceans. This was reported by Yang Yung-sung, Taiwan Ocean Research Laboratory, to annual tuna conference in Shimizu, Japan, Feb. 3-5, 1971. The conference was sponsored by the Far Seas Fisheries Research Laboratory.

Yang disclosed:

The range of Taiwanese tuna fishing expanded after World War II when larger vessels were added. In 1954, the Taiwanese fished as far as Banda Sea off Indonesia; in 1956, they sailed for Indian Ocean; in 1960, for Atlantic.

The Fleet

In 1969, the tuna fleet totaled 1,039 vessels, including 396 distant-water vessels over 50 gross tons. In Taiwan, vessels under 50 tons are "inshore vessels". In 1969, 166 vessel fished in Indian Ocean, 128 in Atlantic, and 102 in Pacific. In 1970, additional vessels increased distant-water fleet to 420.

The inshore vessels, based mostly in Kaohsiung, fish primarily for yellowfin off Taiwan but also in Celebes and Banda Seas. In the latter they compete with Japanese longliners, which average $1\frac{1}{2}$ times more catch.

Peaked In 1969

Taiwan's high-seas tuna fishery peaked in 1969, then began to level off. Vessel owners are troubled by a sharp decline in Indian and Atlantic catches. They are considering switching to Pacific grounds closer to Taiwanese ports. The government reportedly agrees. The Taiwanese tuna fishery is said to be approaching its growth limits.

An economic reassessment is being made. The owners are considering cutting labor costs and installing refrigeration to improve management and reduce vessel-operating expenses.

Tuna Exporters Association

In 1970, a Tuna Exporters Association was organized. It has over half the 230 vessel owners. It is similar to National Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN).

The association's functions include: (1) study of tuna industry; (2) research on marketing and overseas fishing bases, including processing of documents for crewmen going ashore; (3) training; and (4) promoting exports.

World Bank Loans

In 1963, three 1,000-ton and thirteen 300-ton vessels were built with a World Bank loan of US$7.8 million. In 1968, a second loan of $7 million was obtained to build twenty 250-ton vessels in South Korea. In 1970, a $10-million loan was arranged with Asia Development Bank to build 40 vessels, but only 36 firms applied for loans. Over half the applications were approved. This indicates that many vessel owners, faced with management difficulties, are not building more vessels.

Industry Enthusiasm Lacking

Eighteen 160-ton tuna vessels were built in 1967, and 18 in 1968, with loans from Central American Fund (CAF). In 1969, sixteen similar-sized vessels were scheduled for construction with CAF loans but, so far, only one has been built. The government plans to continue build-up program. But lack of industry enthusiasm makes it unlikely at this time.

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BACK COVER: A gillnet is being used to harvest milkfish on a Philippines fish farm. (FAO: P. Boonserm)

The UN's Development Program (UNDP) was helping the Philippines improve brackish-water fish-culture techniques. Fish are a cheap source of protein for the islanders. FAO reports that latest feeding and fertilization practices boosted productivity to meet about 60% of needs.

Milkfish were being cultured in 345,800 acres of privately owned fish ponds.